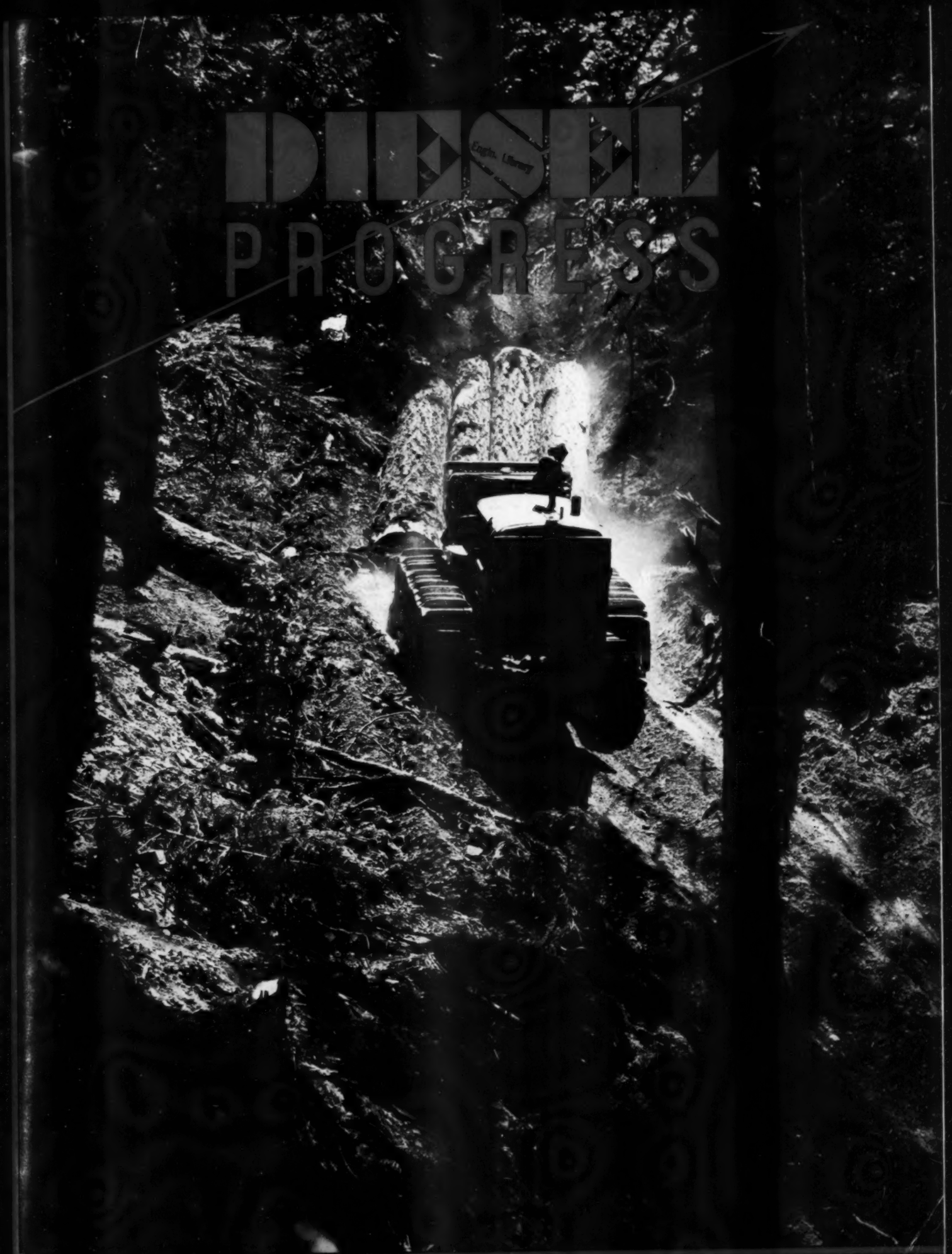


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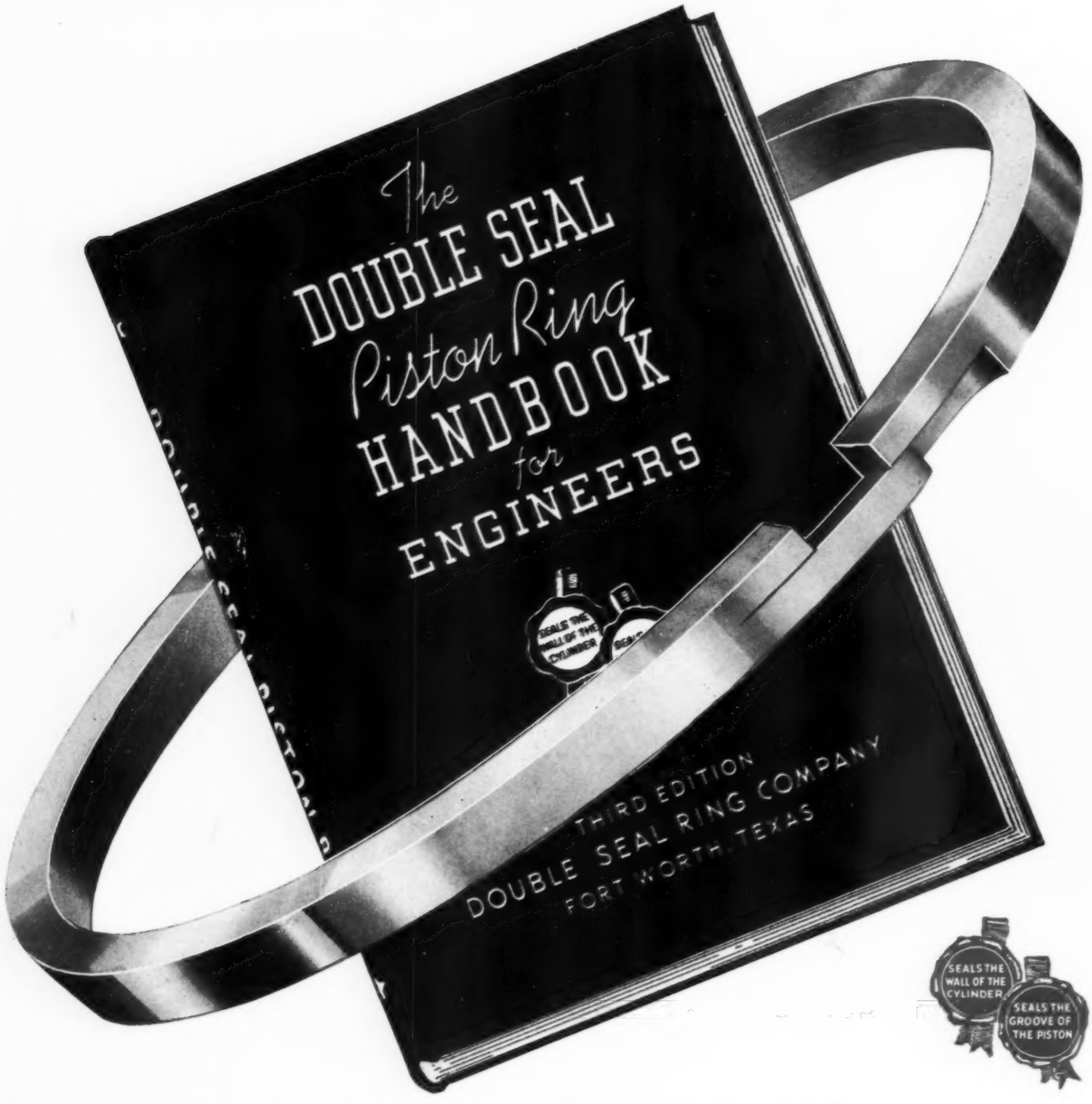


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# DIESEL PROGRESS and DIESEL AVIATION



**REX W. WADMAN**
***Editor and Publisher***

**HEYWORTH CAMPBELL**
***Art Director***

**PAUL H. WILKINSON**
***Aviation Editor***


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FRONT COVER ILLUSTRATION: Howell & Howell of Quincy, California, have been logging since 1920. They have found their Caterpillar Diesel tractors highly efficient and dependable in this rugged work.

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# DIESEL TOWBOAT "TRI-CITIES"

*By* R. D. CAMPBELL

THE Diesel-powered river towboat "Tri-Cities", owned by the Lake Tankers Corporation of Wilmington, Delaware, was placed in service on the upper Mississippi River on August 22. The "Tri-Cities" is the third of a fleet of three Diesel-powered towboats built by the St. Louis Shipbuilding and Steel Company for the Lake Tankers Corporation and placed in service in the season of 1940. The "Twin Cities" with 690 hp. Diesels went into service late in April; the "Midwest Cities" using a single 400 hp. Diesel began service in the latter part of June. The "Tri-Cities" with two 400 hp. main Diesels is the intermediate size vessel of the fleet. All three of the boats are presently engaged in barging gasoline and fuel oil from Hartford, Illinois, to various points up the river including Keokuk, Burlington and Bettendorf, Iowa, and St. Paul, Minnesota. When the shipping season on the Upper Mississippi closes near the end of November, the boats will be used on the Middle and Lower Mississippi, the Ohio, Tennessee, and Green Rivers which do not freeze over in the winter time.

Barge shipping of staple commodities on the Mississippi River system is increasing rapidly and the majority of all towboats built in recent years for this service are powered with Diesel engines. Most of the towboats of over 600 hp. are using two main engines, each directly connected through a drive shaft to its own propeller. The smaller boats are of the single screw type as a rule. The limiting size of power per engine is governed by the propeller size limits. Most of the boats have a draft of from five feet to six feet, which with the tunnel-stern effect, permits the use of a propeller not to exceed 84″ in diameter. Such a propeller will absorb from 500 to 800 hp., depending upon its design, revolutions, and the pool speed of tow: and if more power is required, it is customary to use twin screws.

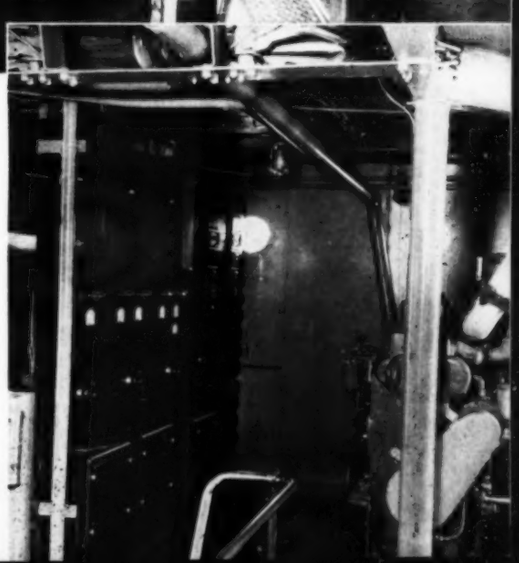
The "Tri-Cities" has an all-welded steel hull measuring 110′ x 30′ x 8′ and has a draft of 5′-6″ when loaded. It is powered with two 5 cylinder, 12″ x 15″ Fairbanks-Morse two cycle Diesel engines which are normally rated 500 hp. at 400 rpm. For the towing speeds involved in this service, 320 rpm. is the maximum efficient propeller speed, at which point each engine rates 400 hp. The thrust bearings are built into the engines and no external thrust bearings are required. Each engine is connected through a drive shaft to a 72″ four blade cast steel propeller made by the Columbian Bronze Company. The boat is capable of pushing four large barges or six barges of the popular 175′ x 35′ x 8′ size. Such a tow would carry approximately 4000 tons of pay load which, if converted into gallons of gasoline which is the commodity now being barged, is 1,200,000 gallons. The normal speed of the boat when handling such a tow is about five miles per hour.

Located under the walkway on each side of the pilot house is a four cell type OC-H American Air Filter Company viscous impingment type of air filter. The air for the engines is drawn in through these filters and through a Maxim air silencer to the reciprocating scavenging air pump where the air is compressed to approximately 1½ pounds pressure for delivery to the cylinders.

The exhaust of each engine is discharged through a 14″ Maxim silencer of the Spark Arrestor type. The inlet air silencers are located directly above the forward end of each engine, while the exhaust silencers are located directly above the aft end of each engine. Each engine is equipped with an Alnor pyrometer with thermocouple connections in the exhaust of each cylinder. The exhaust manifolds are water-cooled, and the exhaust pipes and Maxim silencers are insulated to reduce the heat transmission to the engine room. The exhaust pipe from each silencer is only 14″ in diameter, but it is extended into a ventilated stack of much larger diameter which resembles the smoke stack on a modern steamboat. The ventilated stack is used to induce a draft of warm air from the engine room, and to act as a support for the real exhaust pipe. When one sees a river towboat moving upstream with little or no haze emanating from the stacks, it is an indication that the boat is Diesel-propelled.

One of the unique features of the "Tri-Cities" and her sister boats is provision for cooling the engine jacket water by transmitting the heat through the hull. The hull is constructed with longitudinal bulk heads extending the full length of the vessel and located directly under the walls of the superstructure. This leaves a space about 30 inches wide adjacent to each side of the hull, and this space is divided into a number of compartments which are used for fuel and water storage. One such compartment on either side of the engine room is used to store the engine cooling water and to act as a heat exchanger. Upon leaving the engine, the cooling water flows into the compartment where the water loses its heat through the ⅜ inch steel hull plates to the river water in contact with the outside of the hull. This type of heat exchanger requires no cleaning, and the system, which has been proven very satisfactory, eliminates the use of raw water pumps. As the compartments are located between the engine room and the sides of the hull, they are readily accessible through manhole openings in the walkways along either side of the boat.

The soft water is circulated by means of a reversible centrifugal pump built into the engine. Upon leaving the water compartment or bilge, the cooling water flows by gravity through the lubricating oil cooler to the circulating pump which forces the water through the engine jackets and exhaust manifold jacket and returning to the heat exchanger compartment in the side of the hull. A by-pass water line is arranged to by-pass a part of the water

*Top: The "Tri-Cities" on trial run on the Mississippi River near St. Louis. Center: General engine room view showing the two F-M Diesel propulsion engines. Note Maxim spark arrester exhaust silencers above each engine. Bottom: The F-M, 25 kw. auxiliary Diesel generating set and general switchboard.*

around the oil cooler and thus regulate the temperature of the oil cooler. A similar arrangement of the piping permits the water to by-pass the heat exchanger compartment and permits control of the water without diminishing the quantity of water being circulated through the engine. The side surface of the water compartment is large enough to maintain the engine jacket water within 30° F. of the river water temperature. Even in the summertime when the river is the warmest, a portion of the water is allowed to by-pass the heat exchanger compartment and in cooler weather as much as 75% of the water circulated will be by-passed, allowing the remainder of the water to enter it and transmit heat to the river water.

The fuel oil is stored in four compartments, similar to the water compartments, with two fuel compartments located on each side of the engine room. The total capacity of the fuel oil compartments is 21,850 gallons, which is sufficient supply to keep both main engines operating at full load for seventeen days. The time required for a round trip to St. Paul is a little less than fourteen days, during which time the engines operate for approximately eleven days, and are idle for about three days during loading and unloading operations. The boat, therefore, has an ample supply of fuel for its longest regular trip. In order to trim the boat, both the fuel and water may be transferred to any of the compartments assigned for such materials. Such transfers of fuel and water are effected by two 2" Carter pumps driven by ¾ hp. Century electric motors.

The fuel oil used is Shell Oil Company's DIESELINE which is delivered through a pipe line and hose system, eliminating manual handling. In spite of every effort to prevent dirt getting into fuel oil, it will happen occasionally, and so each engine is equipped with Nugent fuel oil filters in duplex arrangement. The fuel is a clean uncracked distillate having a Cetane number of 50, a viscosity at 100° F. of 38 S.S.U., and is dyed a cherry red for identification.

The engines are of the wet sump type and a supply of lubricating oil is carried in the base of each engine. The lubricating oil is circulated by means of a gear type pump built into the engine. The pump takes the oil from the sump and passes it through a pair of Schutte-Koerting oil filters and the Schutte-Koerting lube oil cooler before delivering it to the oil pressure circuit of the engine. The oil pressure circuit supplies oil to the camshaft, timing gears, and main bearings, from which point it flows through the drilled crankshaft to the crankpin bearings and up the drilled connecting rods to the wrist-pins and the cooling passages in the heads of the pistons.

The engines are also equipped with force feed lubricating systems consisting of Madison-Kipp force feed lubricators which deliver metered quantities of oil to three points on each working piston and to the scavenger pump guide rods. The oil supplied to the pistons is removed by scraper rings located in the cylinder skirt. The dirty oil is mixed with a portion of the oil from the pressure system and the combined supply is processed in a size D-6 Briggs clarifier. Thus, all scraper ring oil is purified before it is returned to the engine sump; also, a portion of the oil in the sump is cleaned with each batch of scraper ring oil.

A small auxiliary oil pump is connected to the engine sump, the dirty oil tank and the clean oil reservoir in such a manner that the pump serves a number of purposes. It is regularly used to supply the dirty oil to the Briggs clarifier; however, it may also serve to remove all oil from the engine sump and deliver it to the clean oil reservoir, or to charge the engine sump with oil from the reservoir. The use of such a pump saves manual handling of the oil and is a much quicker and cleaner method of handing. Shell Oil Company's TALPA Diesel engine oil SAE 30 is used for the main engines; and TALPA SAE 10 is used for the auxiliary engine.

All auxiliaries are electrically operated and use 125 volt direct current which is supplied by 10 kw. Fairbanks-Morse DC generators located above the flywheels of each engine and driven by V-belts from the flywheels. An Exide storage battery, consisting of 56 cells rated at 300 amperes for 8 hours, floats on the line to receive a charge or supply current as the conditions may require. Besides the two 10 kw. generators mentioned above, there is a 25 kw. Fairbanks-Morse Diesel engine generator set known as the auxiliary generator. This unit is operated when the boat is in locks or tied up at dock and the main engines are not running. All three of the generators are arranged to operate in parallel with the storage batteries. The switchboard for the generators and the control panel was built by the Wm. Murdock Electric Mfg. Co.

The engine room and pilot house are well equipped with indicating instruments to assist in proper operation and care of the equipment. Each engine is equipped with two Weston tachometers showing forward and reverse engine speeds up to 600 rpm. One tachometer is located on each engine, and there is a tachometer located in the pilot house which indicates the speed of each engine. Similarly, there is a starting air gauge for each engine located on the engine control panel and duplicate gauges in the pilot house. The engines are equipped with pilot house control and may be operated from either the engine room or the pilot house. Orders may be transmitted from the pilot house to the engine room by bell, speaker tube, or by a Philco electric speaker system. The electric speaker system is of the same type used to interconnect offices or the various departments of large concerns. It is arranged so the pilot may converse with the captain's quarters, the engine room, the galley, or use the loud speaker atop the pilot house to talk to the deck-hands or persons ashore.

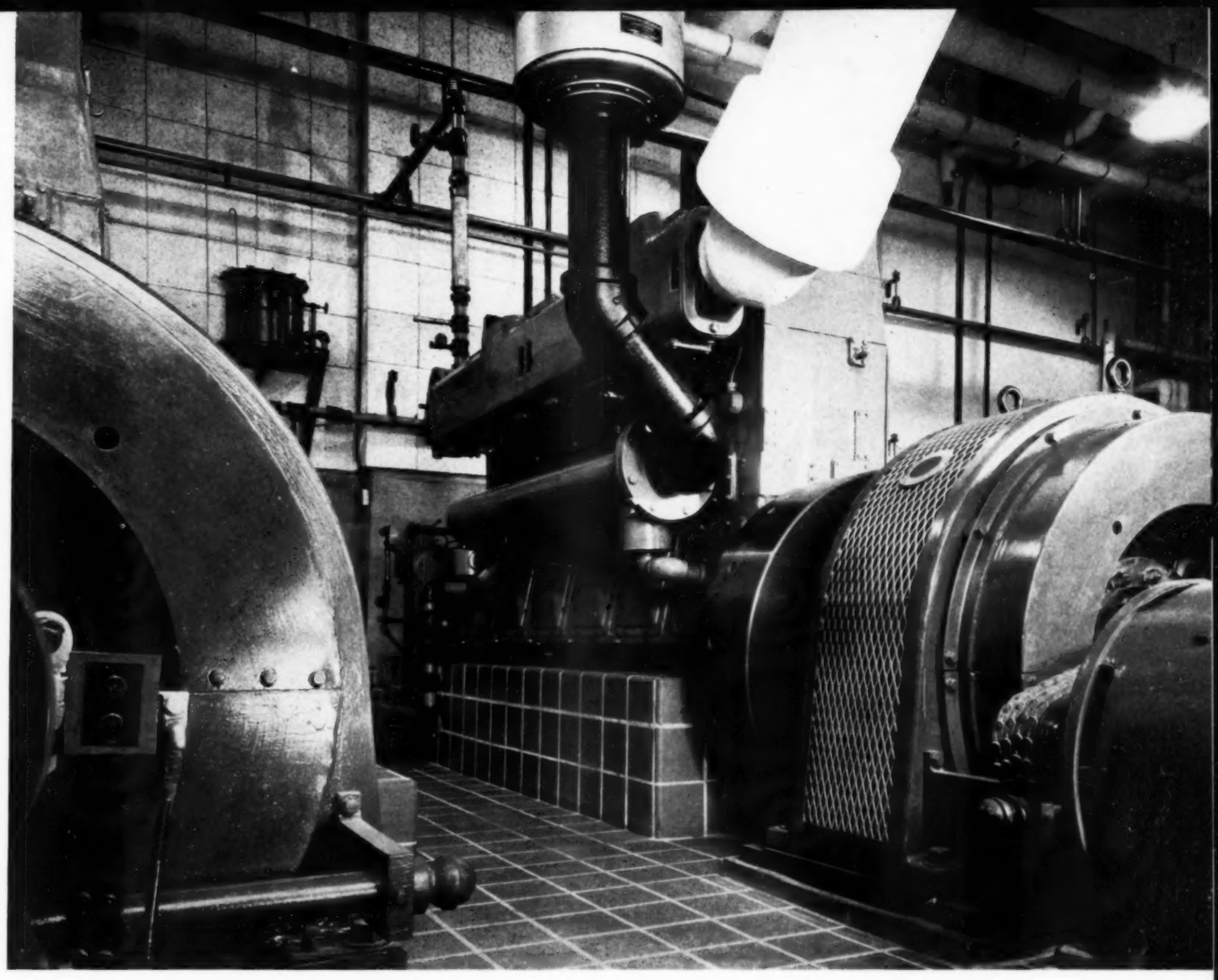
The advantages of the electric speaker system are obvious when it is pointed out that it affords two-way communication with the various parts of the towboat, and puts the pilot in direct communication with the deck hands who may be more than 500′ away from the pilot house. River towing involves the handling of long and bulky tows on relatively small bodies of water, and requires frequent starting and stopping of the tow while passing through the locks.

Each engine is equipped with a built-in air compressor and two 30″ x 96″ air starting tanks. This is sufficient air capacity for a number of engine starts; however, in cases where there is much maneuvering required, it may be insufficient to handle the engines. To care for such extreme cases, an auxiliary air compressor is provided. The auxiliary compressor units consists of a two stage 4½″ x 1⅞″ x 4″ Gardner-Denver compressor V-belt driven from a 10 hp. Fairbanks-Morse electric motor. There is an auxiliary air tank, 20″ x 60″, not regularly assigned to either engine which serves as a special reserve air supply for emergencies. All air tanks, four 30″ x 96″ and one 20″ x 60″, were built by the Morrison Bros. Co., according to ASME specifications for 250 pounds working pressure.

The steering mechanism operating all rudders is hydraulically actuated. A Vickers gear type special high pressure pump supplies the oil at a pressure of 800 pounds per square inch to a double-acting hydraulic cylinder. The piston fitted in the hydraulic cylinder is connected through a cable drive to the rudders. Two such hydraulic cylinders are required, one for the forward rudders and one for the backing rudders.

As the regular cooling water and lubricating oil pumps are built into the engines and do not operate unless the engines are running, an auxiliary pump unit known as a "before and after" pump is added to the equipment for each engine. These pumps consist of a 3 hp. Fairbanks-Morse electric motor with a double extended shaft, one end of the shaft being connected to a 1¼″ Fairbanks-Morse centrifugal pump to handle cooling water, and the other end of the shaft driving a 1″ Roper gear pump for circulating the lubricating oil. The "before and after" pump is started before the engine is started and insures an adequate supply of oil to the bearings and in the piston cooling passages. It is stopped as soon as the engine begins running and the built-in pumps perform these services. The "before and after" pumps are operated for a few minutes after the main engines are stopped to insure a uniform and thorough cooling of the pistons, cylinders, and the engine as a whole.

The "Tri-Cities" is well equipped and arranged for the comfort of the crew. All quarters are clean and light, and are heated in the winter and well ventilated in the summer. Toilet and bath facilities are of the most modern type and are typical of what is to be found in a new home or a good hotel. The galley is attractively finished and lighted. The kitchen is equipped with a monel metal sink, an oil fired stove, electric coffee maker, and a large mechanical refrigerator. There is a lounge or clubroom on the second deck which is equipped with good lights, lounge chairs, a radio, and writing desk.



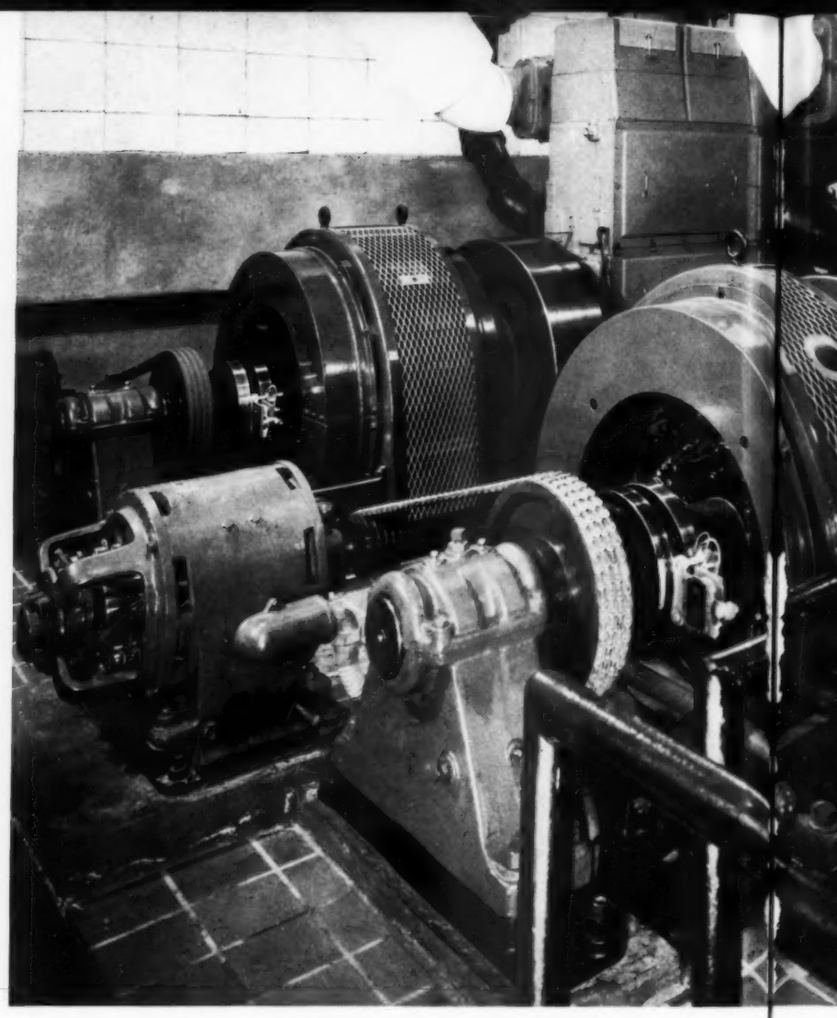
*Exhaust manifold side of No. 1 Superior Diesel showing close-up of Crocker Wheeler generator and Burgess air intake silencer. In the background, Korfund steel spring suspension units may be seen supporting piping.*

# 875 FIFTH AVENUE

*By* DOUGLAS SHEARING

MUCH credit for the present popularity of Diesel economy and dependability by real estate owners and operators in New York and other cities is due the Diesel Electric Company, Inc. As building constructors and engineers they have always been alert to new possibilities in their field and were quick to appreciate the many advantages and substantial savings of Diesel-generated power for city buildings. Readers of DIESEL PROGRESS, who are already familiar with such outstanding installations as Number two Park Avenue, the Manhattan General Hospital, and 20 Park Avenue, will find the latest enterprise of this organization of interest. 875 Fifth Avenue is one of New York's newest and most modern apartment houses and faces Central Park at 69th Street in a neighborhood noted for famous residences. In fact, the house of the late Ogden Mills, former Secretary of the Treasury, was among those that gave way to this modern yet dignified structure, which now accommodates one hundred and twenty-eight families where four lived previously. The architectural drawing by Emory Roth & Sons shows clearly the north and west faces of 875 Fifth Avenue as viewed from across the Avenue.

Since a great majority of Diesel plants now operating in apartment houses, office buildings, and private or public institutions were installed as economy measures after initial construction and operation with steam-generated or purchased power, this installation is of unusual interest for having been incorporated in the architect's original plans. An excellent reason for this is the annual saving in power costs of well over $20,000.00 estimated by Mr. Sol Lautenberg, President, and Mr. Erwin S. Wolfson, Vice President, of the Diesel Electric Company, Inc., on the basis of previous experience.

*View from the switchboard of the two Superior Diesels and Crocker Wheeler generators that provide all electric power requirements at 875 Fifth Avenue, architect's drawing of which is shown at the left.*

The fact that their company owns this building is ample proof of their confidence in Diesels and their judgment of Diesel performance.

The accompanying illustrations show the general arrangement of this well-engineered and compact Diesel generating plant, which occupies one end of the building's engine room and faces the heating boilers. The main generating units are two Superior, six cylinder Diesels directly connected to two Crocker Wheeler alternating current generators, rated at 219 kva at 600 rpm. Either of these main units is capable of supplying all electric power requirements of the building, so that there is always one hundred per cent stand-by service. In fact, all essential equipment has been installed in duplicate to assure a dependable supply of electric current at all times. Woodward governors on the engines provide extremely accurate speed control, and great care has been taken in coupling the Ward Leonard switchboard and distribution panel with the generators to maintain sixty cycle current without any possibility of flickering lights as a result of heavy power surges from the elevator motors. Other engine-mounted equipment includes Purolator fuel and lubricating oil filters, Burgess air intake and exhaust filters and silencers, Alnor pyrometers, and automatic safety controls for lubricating oil pressure and cooling water temperature, supplied by Penn Electric.

The engines are started by compressed air furnished to duplicate storage tanks by two Quincy compressors, one motor-driven and one driven by Wisconsin gasoline engine for emergency service. The main fuel tanks of the building provide storage for 10,000 gallons of #6 boiler oil and 6,000 gallons of #2 Diesel oil. Viking fuel transfer pumps supply Diesel day tanks from this storage automatically to maintain the desired head. Pneumercator direct-reading fuel tank gauges are conveniently mounted on the wall between the engines and the boilers.

The foundation of engines and generators is completely isolated from the engine room floor, as is customary with machinery installations located in residential or business districts, to eliminate any possibility of natural operating frequencies being transmitted to apartments by the steel and concrete structure of the building or by bedrock to other buildings. The entire installation rests on a concrete slab 36 inches deep which, in turn, is resiliently mounted on Korfund steel spring vibro-isolators. These isolators are installed on 18 inches of concrete sub-foundation above bedrock, which comes to the surface in Central Park across Fifth Avenue. All engine piping connections are made with Atlantic flexible tubing, and piping beyond is supported by Korfund steel spring hangers. Thus, it is impossible to tell whether these engines are running or not even when standing directly outside of the engine room door unless that door happens to be open and under no circumstances could the slightest vibration be felt beyond the floating foundation. This type of resilient mounting has been used successfully for practically all Diesel installations in New York and other cities with complete success and has made Diesel economy available to building owners regardless of diffi-

*The method of resilient mounting of engines and generators by Korfund steel spring Vibro-Isolators is clearly shown in this view. The engine sub-base averages 36 inches in depth, providing inertia mass,—with clearance from the engine room floor as indicated by the shadow.*

cult conditions in foundation and construction. Also of particular interest at this plant is the ingenious cooling water system for the Diesels. Instead of utilizing the ordinary type of engine-mounted heat exchanger or a cooling tower on the roof, additional savings have been effected by combining the hot water system of the building with the engine cooling water system. This is accomplished by inserting a Paracoil heat exchanging unit in the first of two hot water system tanks. Hot water from the engine cylinder jackets is pumped through these coils and is cooled to 120 degrees F. Water from the city mains in the tank is simultaneously pre-heated by this exchange and is then pumped to the second tank where it is further heated by the boiler for distribution to the building. In the event that engine cooling water is not reduced to 120 degrees F., an automatic mixing valve in the return line completes the cooling. The saving in boiler fuel by pre-heating service water is obvious.

875 Fifth Avenue is a twenty-story building with one hundred and twenty-eight apartments ranging from three to six rooms each. The ground floor is devoted to doctors' offices, all of which are air-conditioned. It is estimated that the annual load for lighting, elevators, thirty tons of air conditioning refrigeration, miscellaneous motors and refrigerators in apartments will approximate 800,000 kw. hours, with a peak demand of 125 kw. From this it may be seen that the owners have allowed for ample reserve with one engine running in addition to one hundred percent stand-by service. Naturally the generating units will be alternated and this permits thorough maintenance and inspection to insure long life.

From the standpoint of building operation, it is interesting to note that no extra engine room personnel are required because of the Diesel plant. The law requires that a licensed engineer be on duty at all times to supervise the air conditioning equipment, which in this case was installed by the Raisler Corporation of New York, utilizing a Baker ice machine. Therefore, the engine room force of three engineers and a chief engineer is neither greater nor less because of the Diesels. In keeping with the high standard of modern comfort that characterizes the entire building, the engine room is attractively finished with red tile on the floors and Johns-Manville acoustic tile on the walls and ceiling. From the foregoing, it will be seen that no expense has been spared to make this one of New York's finest isolated Diesel plants. It will pay worthwhile dividends to the building owners in the form of cash savings previously mentioned, and dependable service to tenants is a foregone conclusion from the past record of the Diesel Electric Company of engineering and installing similar plants. As this beautiful new building is opened for occupancy it represents one more triumph for Diesel design. With the proven savings of innumerable Diesel plants now in operation in virtually every type of building throughout New York and other cities, it is only logical that this type of power should be preferred for new construction. The trend that was watched with curiosity and doubt some years ago is now recognized as a major solution to many real estate operating problems.

# GERMANY USES DIESELS IN TANKS!

*By* PAUL H. WILKINSON

THE above illustration was difficult to obtain, but it was worth the effort. It spectacularly illustrates the actual production of "Panzerkampfwagen," or armored fighting cars on a vast scale in one of the large plants in Germany devoting its entire resources to producing tanks and armored cars for the tremendously effective Panzer divisions of the German Army. Note the powerful vee-type Diesel engines ready for installation in these land cruisers.

Germany is using Diesel engines in its highly effective mobile fighting units—why don't we?

Diesel engines fit so logically into fighting equipment of this type. First, there is the big fuel saving; then, there is the elimination of the fire hazard: and, thirdly, the torque characteristics of the Diesel are so much better fitted to tank service than the torque characteristics of a gasoline engine.

Think of the obvious advantages the German Army has in the use of Diesels in tanks and armored cars. Its equipment has twice the cruising range, with the same fuel tank capacity, as gasoline equipped machines. Only half the quantity of fuel has to be transported to the fighting units when Diesels are used in place of gasoline engines. And that fuel is non-inflammable, easy and safe to handle against the ever-present fire hazard of handling gasoline over a battle field which has and well might again exceed six hundred miles at its deepest point. We all of us, have read how many of the big French tanks became crematories for their crews, how the gasoline fumes within their big tanks accumulated and eventually caused terrific internal explosions. Gasoline is a highly dangerous fuel for either tanks or armored cars: the very nature of their construction creates the hazard of internal explosions from escaping gasoline fumes.

Why subject our tank crews and armored car crews to this hazard? Why not make our entire tank, armored car, and truck program a Diesel program?

Why not build our new mobile fighting divisions better than Germany's, rather than start them off with two strikes against them?

*The Diesel tug, "Mystic," pushing a barge bound for Port of The Dalles. Note the unusually high superstructure which is required for open river navigation.*

# COLUMBIA RIVER TUG "MYSTIC"

*By* CHAS. F. A. MANN

THE great Lower Columbia-Middle Columbia-Snake River waterway system is becoming a definite economic factor in the Northwest country, and is likewise calling for a new type of river craft and operation—unlike anything ever tried before.

Under the guiding genius of J. L. Hyneman and Capt. Leppaluoto, the Inland Navigation Company and the Upper Columbia River Towing Company have evolved a barge-tug system of handling petroleum upstream and wheat and wool downstream that is swelling river traffic through Bonneville Dam above Portland, Oregon, by leaps and bounds.

In the March, 1940, issue of DIESEL PROGRESS, this writer reported on the unique tug "Keith," the first strictly open river, high powered tug ever built. This Diesel tug handles upriver traffic where no tug of ordinary design could negotiate.

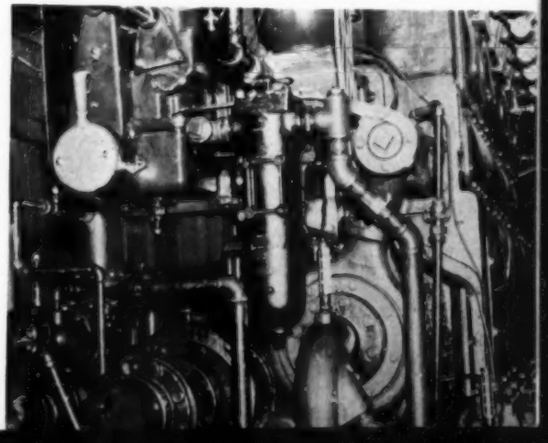
As a companion tug, the company has recently rebuilt and re-powered the Puget Sound tug "Mystic" and, by means of a high-level, river-type pilot house and a new 1,000 hp. Enterprise Supercharged Diesel and full pilot house control, including pneumatic rudders, has evolved a satisfactory smaller size tug that can supplement the larger efforts of the "Keith."

The "Mystic" is 55 feet x 15 feet x 7 feet depth with 5.4 draft, and has a gross tonnage of 33 and a net of 22, and was originally built in Seattle in 1926. The rebuilding process for river work was done in Portland. She now has a six cylinder Enterprise Diesel, weighing 30,000 pounds, which, with the Buchi Exhaust Gas Supercharger, delivers 1,000 hp. at 650 rpm.

The engine has a 12 inch bore and 15 inch stroke and 8½ inch crankshaft. It is equipped with a 12 kw. G. E. generator; Twin-6 Alnor Pyrometer, Dual Weston Tachometers, Blackmer Hand pump, fuel, water and heat exchanger circulating pump; Kingsbury Thrust Bearing and Purolator filters. She carries a closed circuit cooling system with Harrison Heat Exchanger. The Enterprise Diesel operates on Standard Diesel Fuel oil and Standard Delo 30 Lubricating oil.

The "Mystic" operates through The Dalles-Celilo Canal and in the vicinity of Port of The Dalles and Umatilla, Oregon, through a section of the Columbia where unfailing dependability is a vital necessity. A few seconds out of control in this wild river of the West means a smashup on uncharted rocks.

*View of forward end of the Enterprise, 6-cylinder, 1000 hp., Buchi-supercharged Diesel.*




*Union Sand and Gravel Company's dredge, right, and tender "Milburn B" left, both Diesel equipped. The dredge produces 125 tons of solids per hour for an operating cost of less than 1/3c per ton.*

# SAND AND GRAVEL AT ⅓¢ PER TON

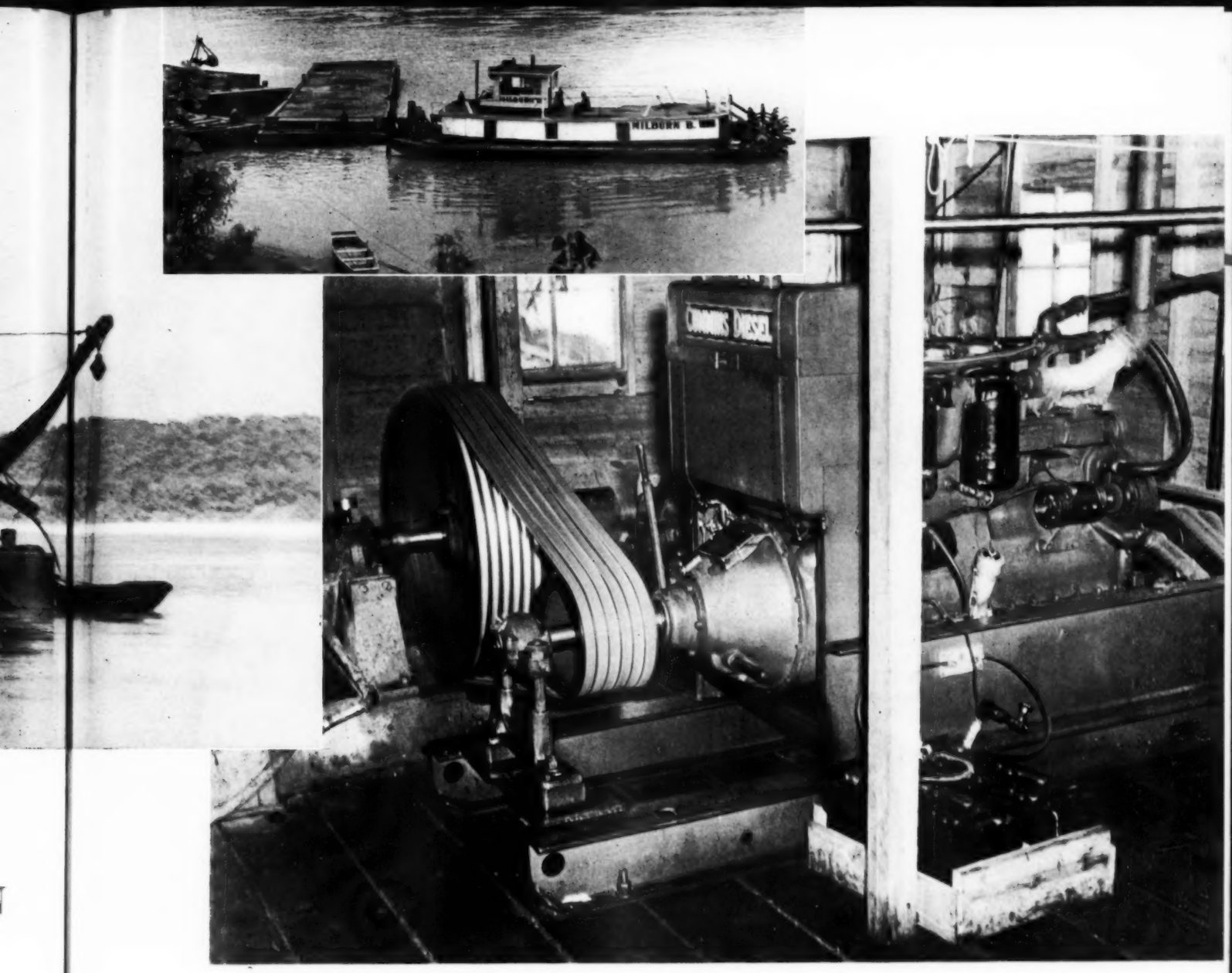
*By* WILL H. FULLERTON

INTERESTING sand and gravel work is now going on at Westpoint, Kentucky, on the Ohio River. Union Sand and Gravel Co., well known dredgers of Morganfield, Kentucky, recently brought their equipment here for work on a new contract. Chief in the interest of the company is their stern wheel dredge tender "Milburn B" which was repowered with a modern high speed Diesel last May. The 60 ft. x 12 ft. x 2 ft. tender, used to transport the company's Diesel-powered dredge boat and to switch and tow sand and gravel barges, has been giving a good account of herself with her new engine.

A small 4 cylinder, 4⅞ in. bore, 6 in. stroke Cummins Diesel was chosen to replace the former 50 hp. gasoline engine. The new engine uses only 2 gallons of 7c fuel per hour. Lubricating oil is changed every 75 hours, none being added between changes. The former gas engine used six gallons of fuel per hour and so much lube oil, it was said, that the oil was never changed.

She now has a speed loose of 10 to 11 mph. Pushing one to four barges, each carrying 250 tons, she travels 4 mph. According to Ray Maddox, superintendent of the company, more speed would be possible if the boat were rigged up behind the engine for it. The 18-year old wood craft has two longitudinal kelsons 12 in. x 16 in. which extend the entire length. The engine is mounted on a pair of eight-foot 8 in. x 8 in. timbers which in turn are bolted crosswise on the kelsons in the forward part of the boat. A shaft 13¾ in. long from the engine is supported by a pedestal type outboard bearing. The shaft mounts a pulley 10 in. in diameter with an 11½ in. face. A 10 in. flat belt on the port side of the boat drives from this pulley to a 48 in. pulley wheel on a jackshaft. A spring-loaded idler is on the belt just behind the engine drive pulley. The 3 in. diameter jackshaft is 6 ft. long and is mounted on timbers. Pulley centers from the engine to the shaft are 11 ft. The engine and the jackshaft are both mounted crosswise in the boat.

Power is transferred from the jackshaft to the main drive shaft in the stern, a distance of 25 ft., with a pair of 10 in. belts. These run over




*View showing the dredge Diesel which is arranged for power take-off at both ends of the crankshaft.*

18 in. pulleys with 12 in. faces on the jackshaft and a pair of 38 in. clutch controlled pulleys on the stern shaft. The "go ahead" belt is crossed to provide forward motion. Reverse wheel operation is made by the uncrossed belt.

In the stern of the boat, the paddle-wheel is driven from the starboard side. A nine-tooth sprocket is mounted on the 2½ in. by 10 ft. shaft and power is transferred to the 36-tooth sprocket on the wheel with a 2½ in. pitch chain. Chain centers are 8 ft. The wheel is 8 ft. in diameter and 10 ft. wide with twelve 14 in. bucket boards. It turns 33 rpm.

The engine's direct cooling system circulates river water picked up in a well or pipe 6 in. in diameter and 3 ft. long mounted in the center of the boat near the forward end. Water is circulated with the standard engine pump. The system uses a ¾ in. Lunkenheimer spring-loaded valve which, after being manually set, controls the amount of water circulated through the by-pass in the engine. The engine exhausts vertically from the front end of the manifold. A 35-gallon fuel tank, mounted on the forward deck just 4 ft. ahead of the Diesel, permits a gravity feed to the engine.

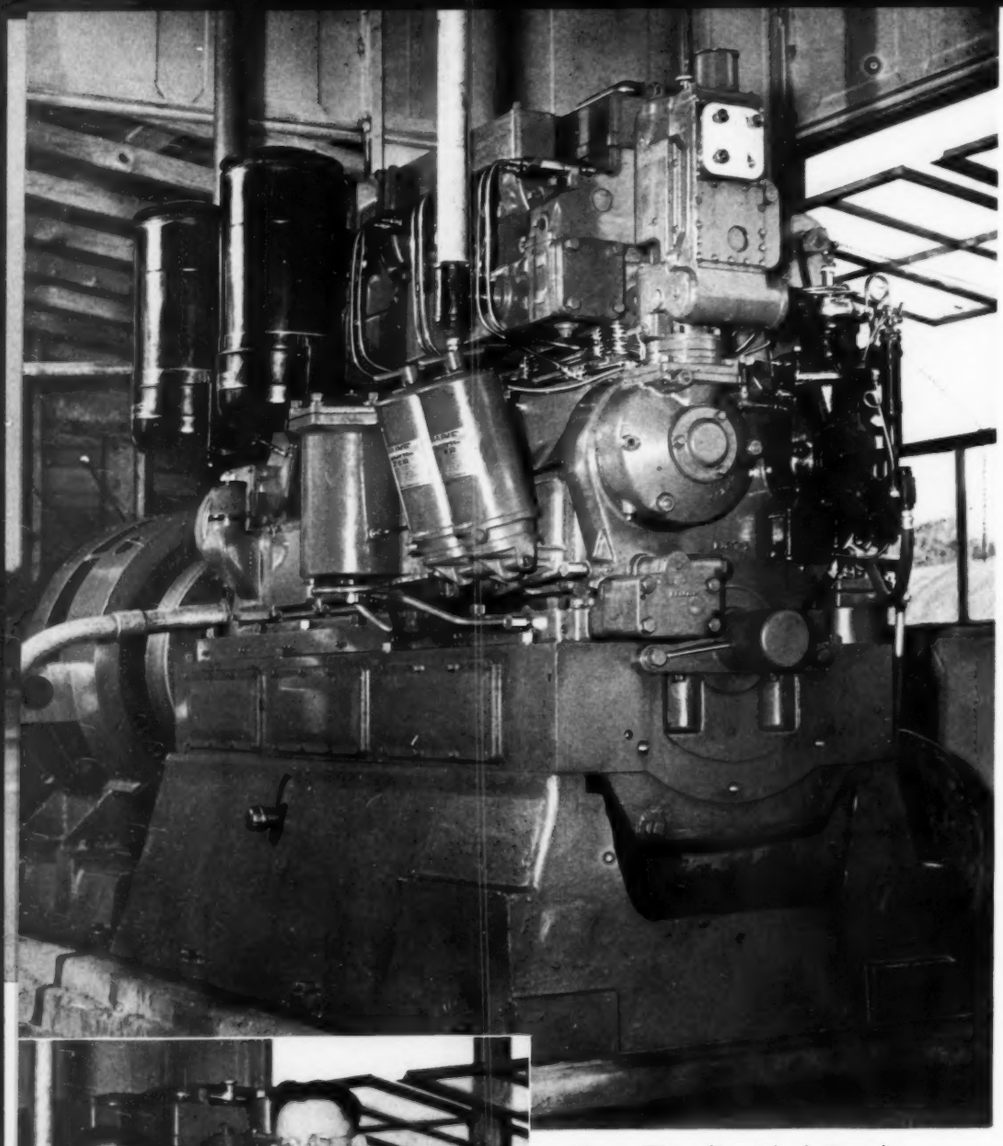
Full pilot house control is provided. The operator, commenting about the new engine said, "She does a better job for less money now. Plenty of power, she handles much better . . . just touch the throttle and she jumps."

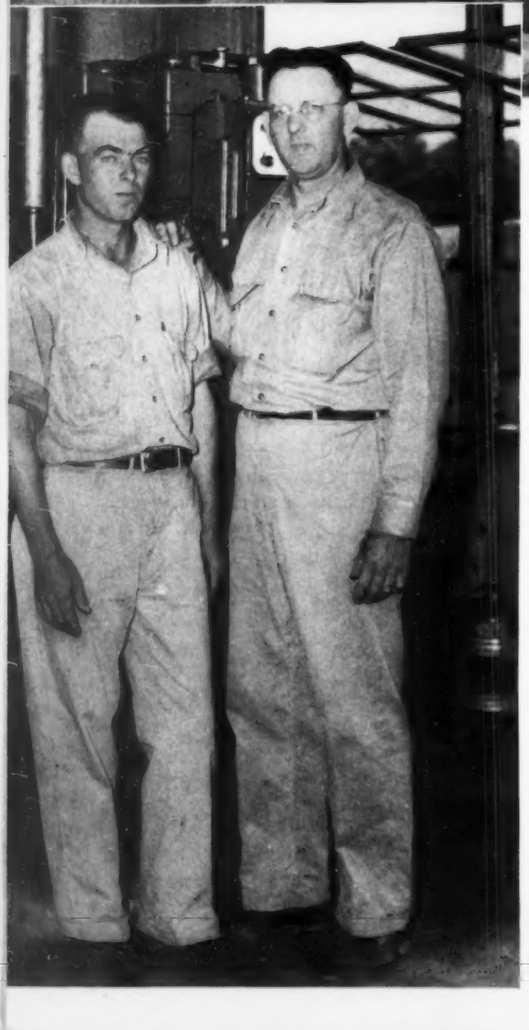
The dredge which the tender services is also an interesting unit. Several years ago, this boat attracted considerable attention by its low cost sand and gravel production. Using an 8 in. Holtz dredge pump powered with a Cummins Diesel, this unit continues to produce sand and gravel for a power cost of less than 1/3 of a cent per ton. The boat which was new in October, 1938, was powered with a Diesel engine principally to escape the fire hazard of gasoline power which destroyed the company's former dredge.

The engine used on the 74 ft. x 28 ft. covered, flush deck, wood hull barge is a 6-cylinder Cummins Diesel similar to the 4-cylinder unit powering the tender.

# RURAL ELECTRIC SERVICE

*By* DWIGHT ROBISON





*Above: The self-contained Cummins Diesel generating set at Calvert City, Kentucky. Note Pickering isochronous governor, De Luxe lube oil filters, Nugent fuel oil filters and Donaldson air cleaners. Left: Robert Carter, day operator, and L. A. Solomon, owner.*

THE folks in the vicinity of Kentucky's New Coffey Dam had needed electricity for years. Ten years ago the people in Calvert City, Kentucky, didn't have a watt of electric power despite a five-year plea to the power company. Aware of his neighbors' need for electricity, Mr. L. Solomon decided to help somewhat, and put a 30 kw. generator on the line shaft of his Diesel-driven flour mill. Thus it was, on June 13, 1931, with eighteen customers, Rural Electric Service was born.

The people in Guilbertsville, the site of the new dam just five miles from Calvert City, had had the same disappointments in their efforts to get electric power. It was a great day when a conference with Rural Electric Service resulted in erecting a line to Guilbertsville. Lights for customers here were turned on January, 1932.

The company has had a steady growth since this start. It now maintains twenty-one miles of primary line supplying electric power to people in a radius of seventeen miles. Today's accounts number some 565 customers, 65 of which were added only since the start of 1940.

The company lost the flour mill and all of its equipment by a fire during the 1937 flood. The generating plant was later rebuilt and the flour mill abandoned. The rapid growth of the company's business recently resulted in a pressing need for more power and an investigation of the Diesel engines available was made.

The final selection was a 100 kw. Cummins Diesel generating set which started to work on May 9, 1940. This full Diesel unit has six cylinders of 7 in. bore by 10 in. stroke, displacement 2309 cu. in. and operates at 720 rpm. The 60 cycle, 3 phase, AC generator built by the Electric Machinery Company delivers 100 kw. 125 kva. at 2300 volts and 31.4 amps per phase. The engine and generator are direct connected and mounted on a common cast iron sub-base.

An accurate record was kept on the operating costs of the new Diesel during the first three weeks of its work. During this time, fuel consumption averaged six gallons per hour. The test was made when the engine was on 24-hour service with an 80% load. Lubricating oil is changed every 100 hours, none being added between changes. With fuel costing 5½c and lubricating oil 38c per gallon, this shows an hourly cost of operation of only $.3984.

The new Diesel generator set was added to the plant's former power which consisted of two large, 2 cylinder Diesel generators, the first a 75 hp., 48 kw. unit, and the second a 110 hp., 60 kw. unit.

*The "Southern Belle," streamlined, aluminum Diesel train of the K. C. S. L. & A. Lines.*

# SOUTHERN BELLE

*By* DOUGLAS SHEARING

THE *Southern Belle* of the Kansas City Southern—Louisiana & Arkansas Lines made its maiden trip into New Orleans on Saturday, August 24, with a group of newspapermen and contestants for the "Southern Belle" charm honors. Made of aluminum alloys, and designed with every detail aimed at living up to the slogan, "Sweetheart of American Trains," the *Southern Belle* was placed in operation between Kansas City and New Orleans on September 1. Powered with Diesel-electric locomotives that will pull the sturdy but light-weight cars on fast, dependable schedules, the *Southern Belle* has been designed to anticipate the needs of the traveling public along the Kansas City Southern—Louisiana & Arkansas rights-of-way. To maintain daily schedules in each direction, three *Southern Belle* trains are required. Each train consists of a Diesel-electric locomotive, a mail and baggage car, a coach, a Pullman sleeper, and an observation-parlor-diner car.

The locomotives are standard models of the Electro-Motive Corporation, while the cars for each train were built at the Pullman (Ill.) works of the Pullman-Standard Car Mfg. Co.

The structural design of the cars was developed by engineers of Pullman-Standard Car Manufacturing Company to ably carry out the basic ideas for the train as conceived by Harvey Couch, board chairman of the Kansas City Southern—Louisiana & Arkansas Lines.

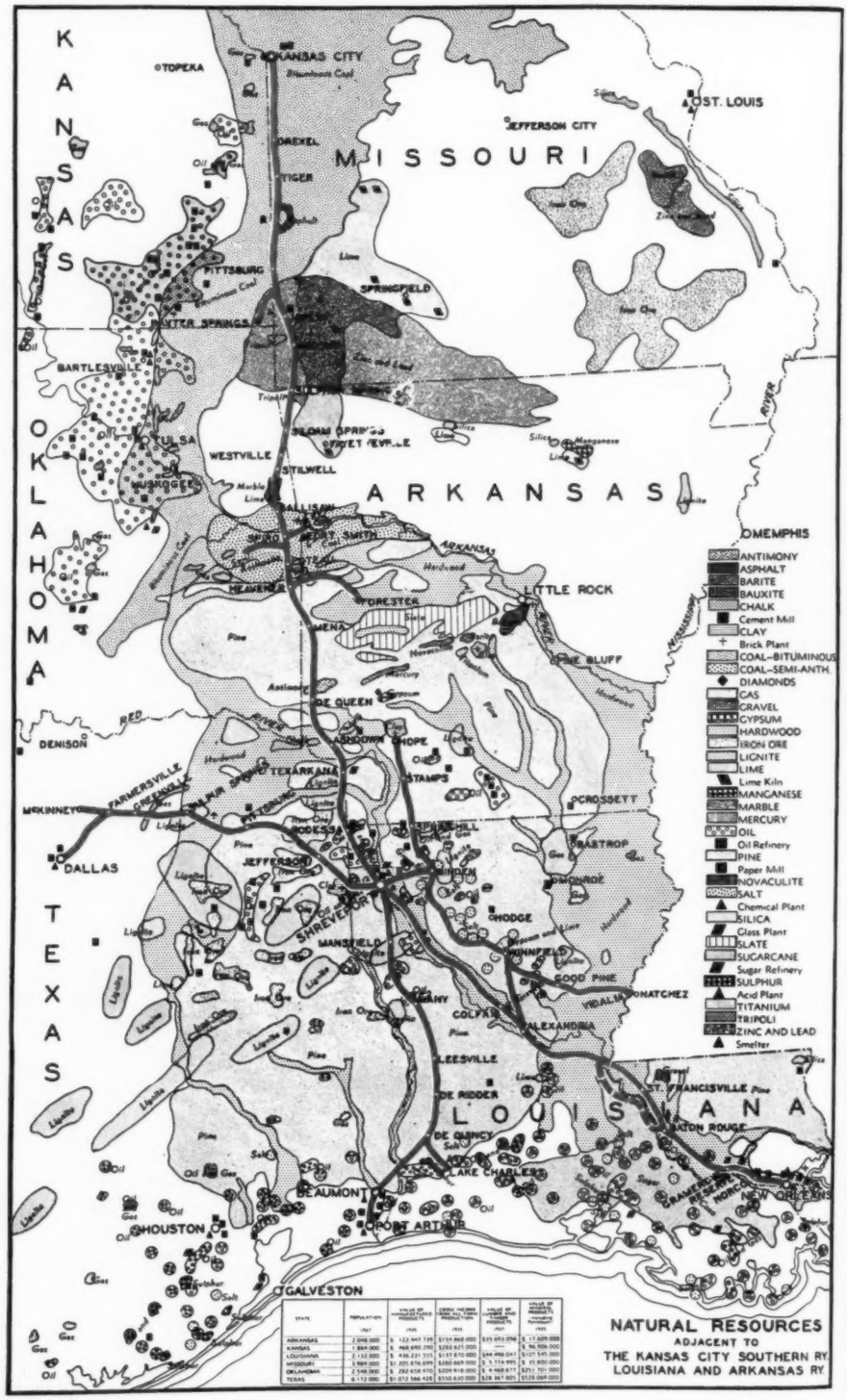
The trains are custom built to fit the particular needs of the territory they serve. They are

largely products of this territory, too. The aluminum from which the trains are made came from bauxite mined in Arkansas; while the glass, paint, woodwork, textiles, and other materials used in the fabrication of the car structures, were selected where practical from the six states in which the Kansas City Southern —Louisiana & Arkansas Lines operate.

Entirely aside from the fact that the principal construction material—aluminum—came from the immediate territory served by the railroad, it was used in the building of the cars in order to obtain the desired light weight without sacrifice of strength and safety. The precision dimensions maintained in aluminum alloy shapes permitted assembly to close tolerances and facilitated construction of the train at a minimum cost for material and labor. The use of aluminum produced a structure with a high strength-weight ratio, making a sturdier car than would be possible by the use of higher-strength but heavier materials. The economical engineering design of the car builder, in cooperation with Aluminum Company of America, has produced car body shells even lighter than have heretofore been built with the aluminum alloys.

Power for the *Southern Belle* is provided by Diesel-electric locomotives purchased from the Electro-Motive Corporation of LaGrange, Illinois. They supply 2,000 hp. each and are the most powerful type of single-unit Diesel locomotive in the world. They are capable of a top speed of 117 miles an hour, but this spectacular feature is of less public interest than the fact that they are designed to cover fast schedules with the lowest rather than the highest maximum speeds. This performance is made possible by the ability of the Diesel-electric engines to accelerate and decelerate more quickly than steam locomotives, their ability to maintain speed on grades, the fact that they can take curves faster with safety because of their low center of gravity, and the fact that frequent changes of locomotives are not necessary nor are frequent stops made for fuel and water. The locomotives have much greater initial tractive effort than steam locomotives of comparable horsepower. This makes it possible to start a passenger train more easily and without discomfort to the passengers.

The cab is separated from the main engine room by an insulated steel partition and door. An outside entrance door is provided on each side of the cab. Special acoustical treatment insulates the cab from engine-room and outside noises, making it possible for the engineer and




*Materials used in construction of the "Southern Belle" trains were drawn largely from the natural resources shown above.*

fireman to converse without appreciably raising their voices.

An automatic oil-burning boiler in the rear of the locomotive provides steam heat for both the locomotive and passenger cars. Each locomotive carries 1,100 gallons of train-heating boiler water and 1,200 gallons of fuel. Ordinary fuel-oil, similar to that used in household furnaces, is used in the locomotives. With full supply of fuel, boiler water and sand, the total weight of each locomotive is slightly less than 300,000 pounds. It is 71 ft. long, 14 ft. above the rail, and about 10 ft. wide.

Besides the essential controls, the operator is aided by such other equipment as indicators on the instrument board to give him instant in-

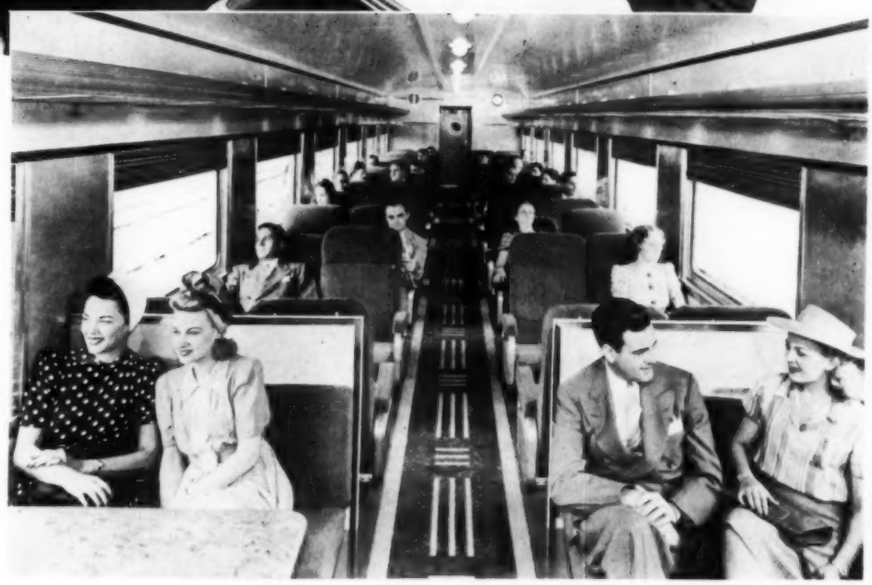
*The observation car is cool and colorful.*

formation as to the condition of the operating equipment behind and beneath him; automatic windshield wipers, defrosters and sun visors; electric horns and safety plate glass in the sloping automobile-type front windows and adjustable side windows.

A unique system is employed in informing the engineer of any abnormal condition in the power-plant equipment. The usual engine water-temperature and oil-pressure gauges are provided. In addition, an eight-inch electric gong and illuminated annunciator box are placed both in the cab and in the engine room. The annunciator boxes have red, yellow and green lenses over lights, which, when they flash on at the ringing of the gong, tell the engineer if there is a hot engine, low oil pressure, or train-heating boiler failure.

Improved riding qualities and greater stability in negotiating curves have been made possible by a new treatment of load suspension. Four hydraulic shock absorbers, coupled with specially designed springs, dampen swaying and also act to ease the body load against the frame when the locomotive is entering or leaving curves.

The power plant of the locomotives consists of two 1,000-hp. General Motors two-cycle V-type 12-cylinder Diesel engines, directly connected to a General Motors d.c. generator which supplies current to four General Motors traction motors mounted in the trucks so that they are geared directly to four driving axles. Power is thus applied at the rails through eight wheels.



*Interior of one of the coaches on the "Southern Belle."*

Controls in the locomotive are simpler than those of an ordinary automobile. It takes less manual effort to stop the train and start it than it does to start and stop an automobile, despite the power at the command of the engineer. Essential control consists of an emergency control pedal which automatically stops the train if the engineer's foot leaves it; a throttle lever to control the speed; a reverse lever; and the usual train and locomotive air-brake levers. Engineers have much less work to do on a Diesel than on a steam locomotive.

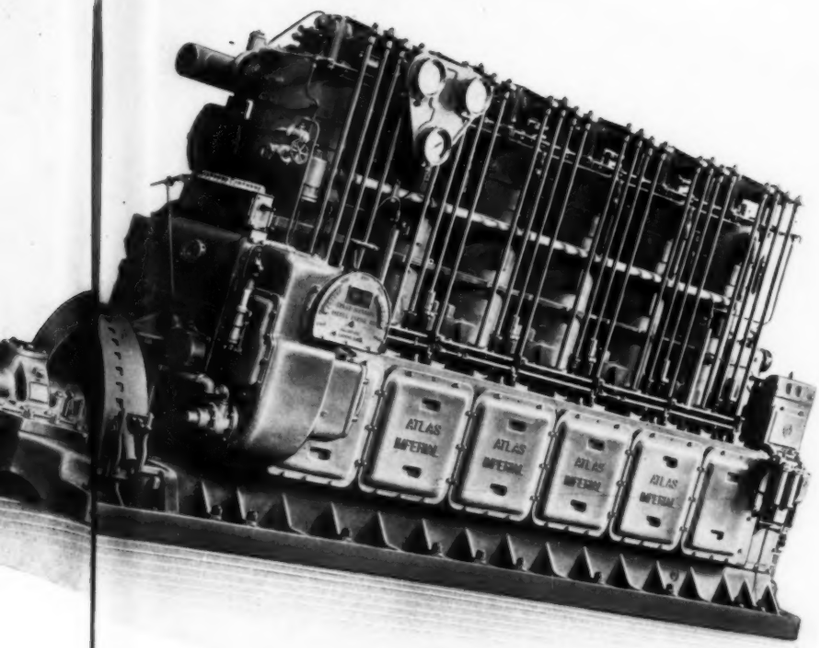
# SOUTH POLAR DIESEL PERFORMANCE

*By* OTIS A. SIBLEY

To the wealth of information that Admiral Byrd has contributed to science as a result of his South Polar explorations can now be added vitally important observations regarding marine Diesel operating characteristics in Antarctica. Previous to the United States Antarctic Service's current expedition, steam propulsion had been used exclusively for ships engaged in both Arctic and Antarctic exploration. Dangers and disadvantages of coal-firing, however, had always constituted major problems, the more serious of which were danger of fire and the bunkering of sufficient coal for the voyage at the sacrifice of many other vital supplies. In addition, much fuel was wasted during stand-by periods to maintain steam pressure in case of emergency. The safety, economy, and convenience of Diesel propulsion seemed to solve all of these problems, and, when the United States Government commissioned the sixty-five year old ice breaker, *Bear of Oakland*, as Flagship of the 1939-41 expedition and renamed her U. S. S. *Bear*, steam equipment was replaced by an Atlas Imperial Diesel engine for main propulsion and General Motors Diesels for auxiliary power. Performance records of the rugged, heavy-duty type of main engine selected indicated that it was capable of meeting successfully all demands imposed by this most difficult of marine service. The first round trip to "Little America" having been completed with this new equipment and the new Diesel thoroughly dismantled for inspection at the Philadelphia Navy Yard, much information is now available to justify the decision to convert this ship in order to reduce fuel tonnage by 50 per cent without sacrificing cruising range and to permit the loading of 200 tons additional supplies for the safety and comfort of personnel.

Immediately following eighteen hours of new engine trials, the *Bear* left Boston on November 22, 1939, put in briefly at Norfolk and Panama, and then made an uninterrupted trip of roughly 7,000 miles from the Canal Zone to "Little America", arriving there on January 14, 1940. On this leg of the trip, the main engine operated continuously for 991 hours. Extensive exploration cruising followed, preliminary to establishing the East Base, during which the *Bear* skirted the ice for over 1500 miles, penetrating wherever possible to launch a plane for aerial observation, and was instrumental in charting considerable new coast line between Victoria Land to the west and Marguerite Bay to the east of "Little America". It was on one of these trips that pack ice closed in on the vessel and six hours of constant ice breaking were required to reach the safety of open water less than a mile away. During critical situations of this kind, an average of four or five engine room bells per minute was not uncommon with perfect response at all times. Other situations comparable to this one were numerous and tested men and equipment to the utmost. Before enumerating certain of these, however, a factual account of the trip is in order for a complete understanding of main propulsion Diesel performance data.

Time of the voyage from leaving Boston on November 22, 1939, to arriving at Philadelphia on June 5, 1940, was 218 days, during which the *Bear* travelled approximately 25,000 nautical miles through temperate, tropic and Antarctic climates and weather. The 600 hp. Atlas Imperial main propulsion Diesel operated 3,082 hours out of the 5,232 hour trip, or 60 per cent




*The 600 hp. Atlas Imperial Diesel Engine as installed on Admiral Byrd's Flagship U. S. S. "Bear."*

*Left to right: Rear Admiral Byrd, Captain Cruzon, Chief Engineer Dawley of the U. S. S. "Bear."*

of total elapsed time and was used at all times when the vessel was under way, with or without sails set. The only exception to this occurred rounding Cape Horn on the return trip when the main engine was shut down for a few minutes for the crew to enjoy the experience of "sailing around the Horn". Out of one period of 118 days there was only one day of twenty-four hours when the main engine was completely secured with the ship moored to the ice. Even then, as was required throughout the entire voyage, the engine room was maintained on fifteen minutes' notice.

Normal speed for the trip was 8½ knots with the engine alone and 9½ knots with engine and sails. Naturally, headwinds buffeting the broad bow of this old sailing ship reduced speed considerably on many occasions. Storms were encountered that far exceeded any previously experienced by officers or crew, despite their many years of service in all parts of the world. These blows frequently lasted four or five days without a lull, during which the ship rolled as much as 48 degrees with 30 and 35 degree rolls more often the rule than the exception in the more southern latitudes.

Consumption of fuel and lubricating oil is of particular interest under such conditions. Of the 1,400 gallons of lube oil taken aboard at Boston, 600 remained in the tanks untouched when the *Bear* docked at Philadelphia. None was taken on after the initial filling, and both main and auxiliary Diesels were supplied from the total of 800 gallons actually used. When it became apparent that lubricating demands of the Diesels were unusually light, oil was changed every 500 hours and no attempt was made to reclaim it other than the continuous centrifuge system regularly employed. The same grade of lubricating oil was used throughout the entire trip whether the ship was passing through the Panama Canal or skirting the ice near the South Pole.

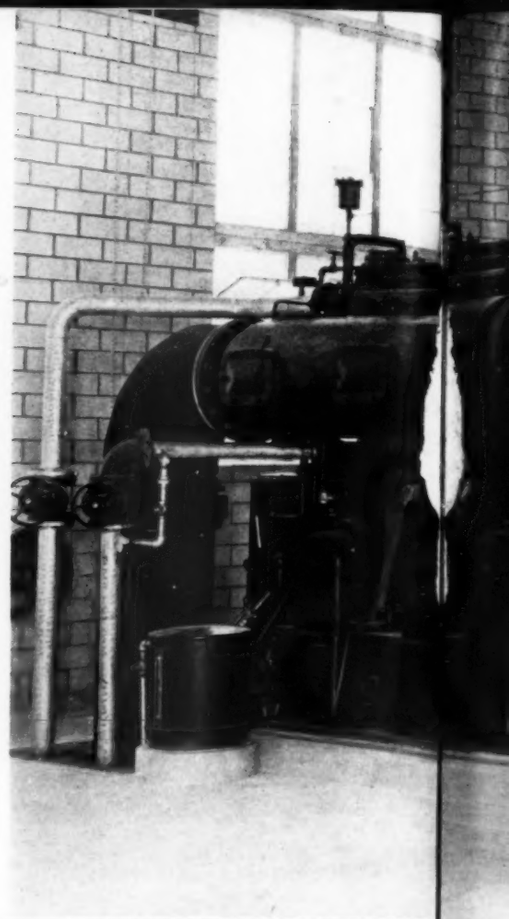
Fuel oil burned totalled 82,282 gallons for main and auxiliary Diesels, heating boiler and galley range. While no specific accounting is available for each separate use, it is estimated that from 2½ to 3 gallons of fuel were required per nautical mile for the main engine. A fair average on the return trip is 575 gallons per day for all purposes, with an average run of approximately 200 nautical miles. Under normal operation the auxiliary Diesels burned about 40 gallons of fuel every twenty-four hours and the galley about 15, with another 40 gallons used for firing the heating boiler in cold weather. Extra fuel oil was carried in drums on the supply ship *North Star* and was taken aboard both in the Bay of Whales and at the East Base with much greater ease and safety than coal was transferred on previous trips.

So much for performance, which was expected from the engines when they were selected. Of particular interest, however, is the condition of the heavy-duty, main propulsion Diesel when overhauled and inspected in preparation for the return to "Little America" this fall. With so many lives at stake, each part was scrutinized with the greatest care, yet the only replacements were the top rings of each piston, and one main bearing that had a small chip about the size of a dime. In any other service, these could have been left safely for many more hours of operation but were replaced for extra precaution against future emergencies. No carbon was discovered that could not be wiped away with a soft cloth and all piston rings were free in their grooves. It might be noted at this point that the performance of the General Motors auxiliary engines compared favorably with that of the main engine.

From the foregoing account of South Polar Diesel performance, it is obvious that the first six months of operation of the U. S. S. *Bear's* new main engine proved to be only a shakedown cruise for it, despite 25,000 miles travelled, maneuvering to avoid or break suddenly shifting ice floes, bucking 100-mile-an-hour winds, violent temperature extremes, and mountainous seas causing 48 degree rolls. Although repeated trips to the bottom of the world add constantly to Rear Admiral Byrd's wide knowledge of conditions to be faced, they in no way minimize the dangers involved. His faith in heavy-duty marine Diesel engines is equalled only by his appreciation of their economy and dependability.

# WEATHERFORD, TEXAS

*By* A. V. REITER



WEATHERFORD, Texas, the county seat of Parker County, is set deep in the Cross Timbers that separate the prairie land from the plains rising to the Rockies. West of Ft. Worth, it is "out where the West begins," and is famed as a pioneer settlement, as the fruit and melon center of Texas, and as the home of Mary Martin. With the installation this June of its new Municipal Light and Power Plant, Weatherford has added another distinction to its name—that of the ownership of one of the finest municipal generating plants in the Southwest. The citizens have made an important step which will pay big returns by increasing the earning power of their community without increasing its taxes.

Over one-half million dollars in cash will be turned over to the people of Weatherford within the next twenty years. More explicitly, the amount of the net earnings as set forth by the bond holders and the engineers is $662,000.00. This is considered to be a conservative estimate of the profit over and above the original cost of the plant, and over all investment charges.

Weatherford has been carrying on a steady building program and a system of improvements which has reached the highest point of its record with the installation of its light plant, the newest addition to the increasing number of municipally-owned plants in the state of Texas. At the official opening June 21, over fifteen hundred people came to see the plant in operation. The building is conceded to be one of the most modern and attractive in the Southwest, in both architecture and equipment. The building itself is modernistic in design, constructed in two-tone vertical lines of buff and brown brick with an artistic original design symbolizing the brush generator placed over the main entrance. The interior of the building is buff glazed tile, designed not only to hold the three new 450 hp. generating units installed for present service, but to allow for a total of 2200 horsepower.

The entire financing was handled by the issuance of 4% interest bearing revenue bonds. These bonds are to be paid for solely from net revenues of the light plant. They can never become a tax burden upon the citizens.

The approximate costs in detail are as follows:

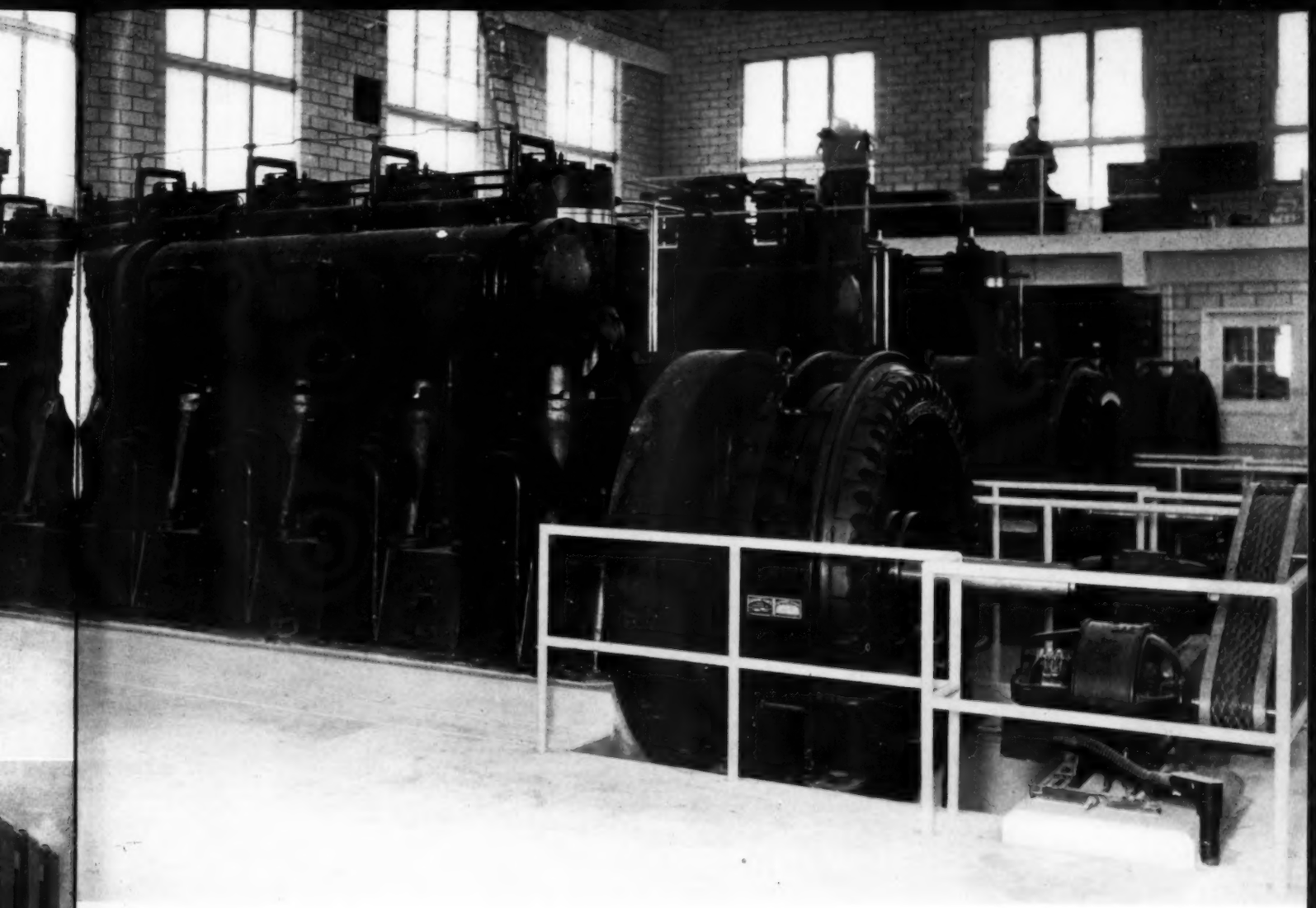
| | |
|---|---|
| Land and improvement | $ 4,000.00 |
| Power house and equipment | 129,833.09 |
| Distribution system | 88,912.03 |

*Right, the modern building which houses the three new 450 hp. Fairbanks-Morse Diesels and generators, above, at Weatherford, Texas.*

| | |
|---|---|
| White way lighting system | 10,000.00 |
| General equipment | 1,500.00 |
| Engineering and supervision | 12,500.00 |
| Legal and administrative and contingencies | 3,254.00 |
| TOTAL COST OF PLANT AND SYSTEM | $250,000.00 |

The retirement and surplus is figured conservatively. It is based on the city acquiring only 70% of the business, at the outset, and securing the remainder at the rate of 5% per year until approximately 90% of the total electric business is held by the municipal plant. While these expectations are based on a maximum of 90% of all the electric business, the private utilities franchise expires in 1946, offering the probability that the municipal light plant may secure all of the business after that period.

The new plant has installed three 450 hp. Fairbanks-Morse, Model 32E14, 300 kw. Diesel generating sets with direct connected FM alternators and "V"-belt driven exciters. Each engine is equipped with a Woodward I. C. governor. The city and their consultants have selected auxiliaries with the allowance for the 50 per cent expansion of the generating plant. The Allis-Chalmers switchboard includes an extra blank panel which will carry the instruments for a future unit.



Instead of a cooling tower, the plant has built an attractive spray pond in which are used Binks spray nozzles. The spray pond handles the raw water while the soft water is cooled through two Ross Heater & Manufacturing Co. shell and tube heat exchangers.

To assure low operating costs on fuel oil, lubricating oil, and engine maintenance, the most modern equipment is being employed. A Goulds Hydroil centrifuge cleans the fuel oil. The lubricating oil is cleaned by a Hilco continuous lubricating oil reclaimer. American OCH air filters protect the engines from dust. There are duplicate Alnor pyrometers, one for checking individually the exhaust temperatures on 18 engine cylinders, and the other for checking the water outlet temperatures. In addition, the plant has installed an Edwards audible alarm system to warn of excessive temperatures or pressure drops. The alarm is put into operation by Detroit Lubricator switches. Many other gauges and thermometers, mainly manufactured by Marshalltown, Diesel Plant Specialties, and Lonegron, are used for the closest observation of the plant.

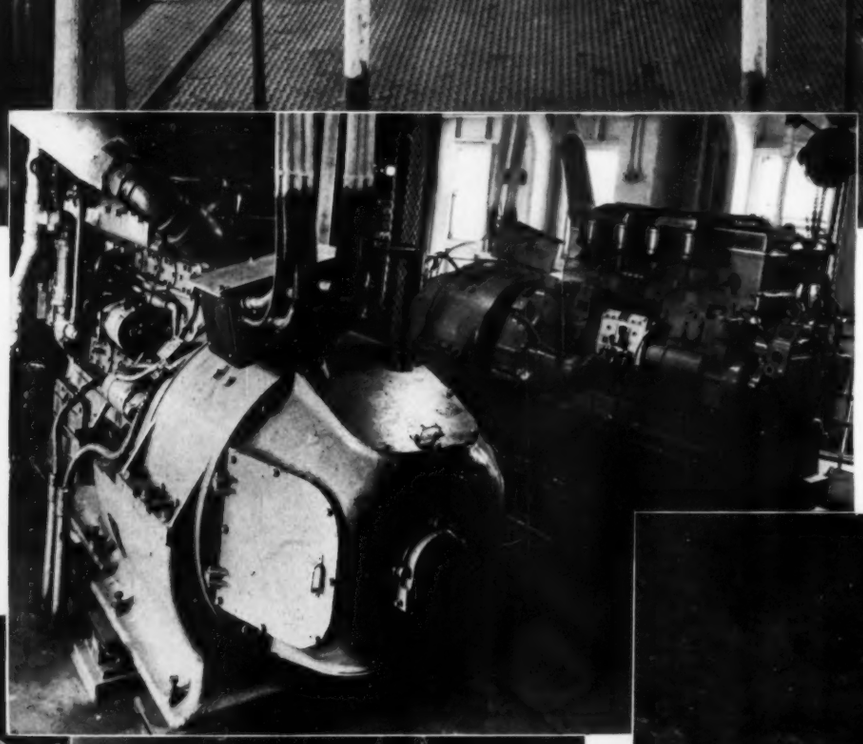
Auxiliary equipment to assure facility and quickness of service is amply installed, among which is a three-ton Chisholm Moore traveling crane, one electric motor driven, and one gasoline engine driven Gardner-Denver Air Compressor supplying air to three 30 inch by 72 inch Diesel Plant Specialty air receivers. All steel and iron pipe fittings are by Crane Company. A feature somewhat new to Texas plants is the manner of heating the building. This is accomplished by having the exhaust silencers jacketed, and air circulated around them and into the building by means of General Electric fans.

Weatherford, building for the future, has every assurance that its 1350 hp. in Diesels will work to make it a bright one. Each citizen is a stockholder in the plant, and each considers the plant an asset which will contribute to their mutual success.

All engineering, including preliminary and final plans and specifications, was prepared by Albert C. Moore & Company, Consulting Engineers of San Antonio, Texas, and Joplin, Missouri. This firm, which specializes in municipal improvements exclusively, likewise designed the system and supervised the construction.

The Plant is managed by a Board of Control, which was established a short time before the system was put into operation. It consists of four members who serve without compensation. They are J. C. Hayes, T. C. Hatchett, Joe B. Witherspoon, and Carl Hartness.

The final section of Weatherford's present Improvement Program includes a $350,000.00 Water Works System and source of supply. Wells having proven unsatisfactory for this region, the City Commission expects to begin work very soon on a surface supply and the installation of a distribution system.



*Top to bottom: Upper engine room of the "Wm. Penn"; note Alnor Pyrometer flanked by Weston tachometers, center of gauge board; the two Superior Diesel auxiliary generating sets; and one of the Superior Diesel propulsion engines. Below: The "Wm. Penn" off Neville Island, Pittsburgh, on trial runs.*

# DIESEL TOWBOAT "WM. PENN"

*By* WILBUR W. YOUNG

BUILT by Dravo Corporation for Union Barge Line, launched on June 19, and now successfully through her trial runs, the twin-screw Diesel towboat, "Wm. Penn" will shortly enter service as the most powerful boat in the Union Barge Line "Great White Fleet." Test results indicated that the effective thrust of this new boat is greatly superior to that which has been developed by boats of conventional design and equivalent power.

The favorable results obtained in tests were due to three chief factors: that of the hull lines, predetermined by tank tests; the use of Kort nozzles in connection with the twin screw propellers; and the flexibility of her twin Superior Diesel propulsion engines. Flanking tests were indicative of extremely fine maneuverability and general handling qualities were good under test conditions which are seldom, if ever, encountered in actual service. With engines operating normally she developed a free running speed of 12.58 mph.

The "Wm. Penn" represents decades of experience in the construction and operation of river towboats and at the same time marks a departure from much that is traditional in river craft design. Even her master, who "grew up" with stern paddle steamers was one of the most enthusiastic observers during her trial runs, in fact from now on he is a Diesel convert.

These river towboats are big by comparison with harbor craft of equivalent power. The "Wm. Penn" has an overall length of 176′, a beam of 36′, and a depth of 10′. Her draft with 105 tons of fuel aboard is 6′ 9″. Both the hull and super-structure of the "Wm. Penn" are of all welded steel. In the midships hold space is the propelling machinery, with the auxiliary generating sets located just forward of this space on the main deck.

Her main engines are two Superior Diesels of 8 cylinders each, 14½″ bore, 20″ stroke, rated 650 hp. each at 270 rpm. The engines are 4 cycle, solid injection and direct reversing. Fuel oil is centrifuged in two De Laval Unimatics and passed through purolator twin filters before injection by American Bosch individual pumps. Lube oil is reclaimed in a Hilco batch type reclaimer and is continuously filtered through Nugent twin filters. The main engines are fitted with Burgess air intake Snubbers and Maxim spark arrester exhaust silencers. A sixteen point Alnor pyrometer indicates exhaust temperatures on both engines. Engine speed is shown at the engineer's post in the engine room and in the pilot house by duplicate Weston electric tachometer dials. Vortex crankcase breathers are fitted for each cylinder.

Electrical energy for lighting and power requirements is supplied by two auxiliary generating sets consisting of Superior Diesels and Crocker-Wheeler 50 kw. generators. The engines are fitted with Leece-Neville electric starting equipment, Purolator fuel and lube oil filters, American Bosch fuel injection, Fulton Sylphon safety controls and Gross lube oil coolers.

The "Wm. Penn" is the seventh screw-propelled Diesel towboat designed and built by Dravo Corporation for service in various of its divisions. The "Wm. Penn" will go on her maiden voyage to New Orleans early in September. Under design and construction are five more towboats, some of which will embody greater departures from traditional design but all of which will be Diesel equipped. The new tunnel hull, Kort nozzle twin screw and Diesel propelled craft are certain to replace the erstwhile familiar stern paddle steamers which, while picturesque, can no longer compete.

The most seasoned of veterans could not help but marvel at the agility of the "Wm. Penn" in flanking and maneuvering twelve barges measuring 176′ x 26′ each loaded with a total of 12,000 tons of coal during her trial runs. She is amply designed and equipped to meet the steadily increasing volume and variety of Mississippi and Ohio upstream tonnage.

*A typical built-up supply canal with screened intake.*

# OVERHEAD IRRIGATION FOR BANANAS

*By* GEORGE D CROSSLEY

MANY of the banana plantations of the United Fruit Company are located in tropical areas where long dry seasons are the rule. The water requirements of the banana are such that effects of drought must be offset by supplying water at regular intervals to the growing plants. For many years, surface irrigation methods have been used for this purpose in some locations. More recently a system of overhead irrigation, or sprinkling, has come into use in banana cultivation.

Overhead irrigation is not new, having been used, particularly in the western part of the United States, for many years, both as permanent installation with underground supply pipes and permanently located sprinklers, as well as installations involving portable pipe and equipment. The latter system has been used quite extensively and for certain conditions has proved very satisfactory. There are numerous advantages claimed for overhead irrigation, some of them being: conservation

of water; simulation of natural rainfall; soil does not form a heavy crust; greater utilization of land, due to elimination of ditches required for surface irrigation systems; elimination of huge water-table conditions resulting from surface irrigation; more even distribution of water; and more effective drought control.

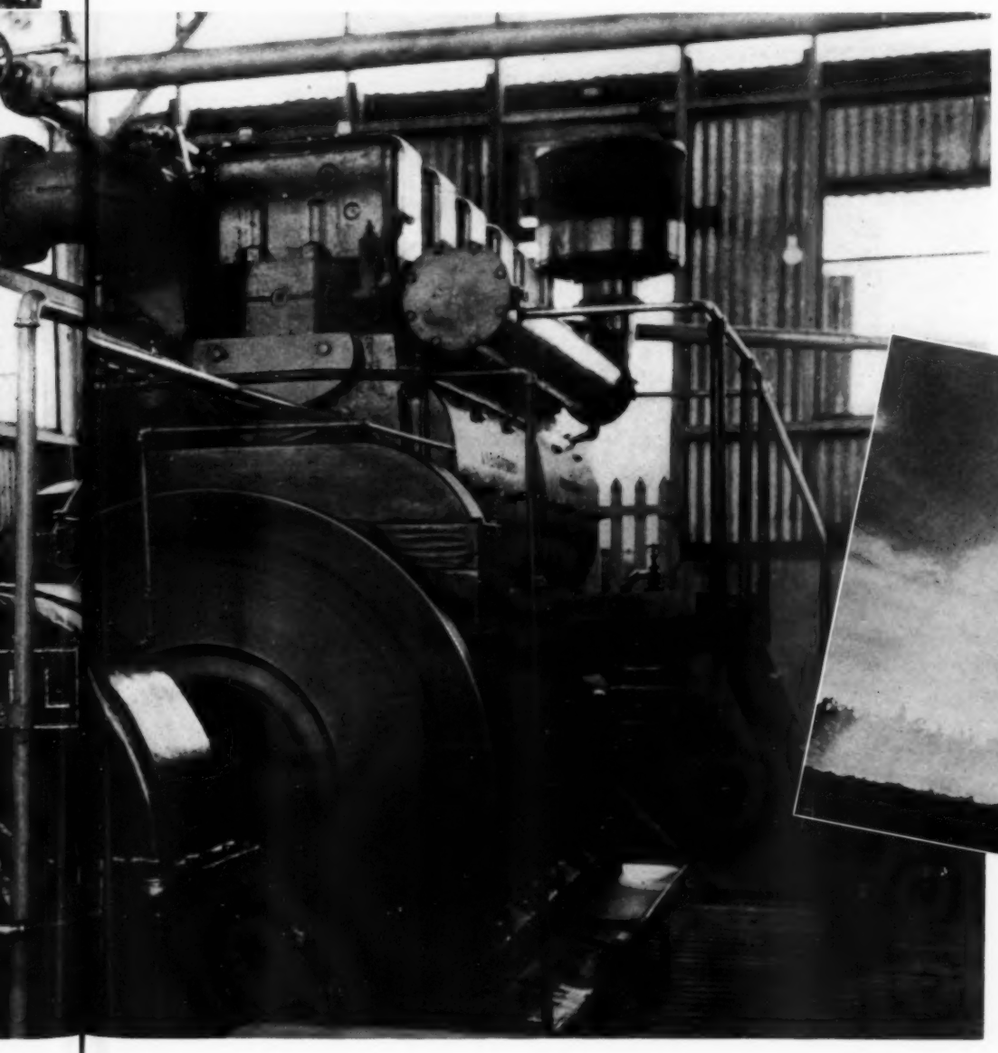
Pumping plants, whenever possible, are located near the center of the area to be irrigated in order to eliminate long runs of large diameter pipe. This procedure is varied, when necessary, or when it is found economically advantageous to locate the pumping plant at the water source. Capacities of pumping plant facilities are determined by the number of riser groups comprising an irrigated area. Pumping capacities of individual units vary from 2,000 gpm. to 5,000 gpm. Buildings and structures for overhead irrigation are nominal but are definitely designed to meet operating conditions.

Strict standards of maintenance are adhered to at all times and detailed operating records are maintained. Operators of overhead irrigation pumping plants are carefully schooled and supervised to insure dependable care and operation of the equipment under their control. Inspection of engines, pumps and all auxiliary equipment is arranged in accordance with the recommendations of the manufacturers of the pumping plant equipment. Equipment must be of rugged construction to withstand the severe operating conditions imposed by twenty-four hour operation over long periods. Although there are some exceptions, practically all of the overhead irrigation installations operated by the United Fruit Company are powered with Diesel engines.

The plant here illustrated is powered with two Alco railway type Diesel engines for universal application of six cylinders each, 12½" bore, 13" stroke, rated 540 hp. at 600 rpm. These engines are fitted with Burgess intake snubbers, Maxim exhaust silencers, Ross lube oil coolers, Cuno fuel and lube oil filters. A Skinner clarifier handles reclamation of lube oil for both engines. The closed jacket cooling system takes cooling water for the heat exchanger from the discharge side of the irrigation pump. The drive is through Farrel-Birmingham speed increasing gears to Morris 2-stage pumps of 5000 gpm. capacity, 360 feet head at 1700 rpm.

At the present time, approximately 50,000 acres of United Fruit Company banana cultivations are being irrigated by overhead systems. These installations necessitate the operation of Diesel engine pumping units having a total of approximately 25,000 applied horsepower delivering more than 200,000 gallons of water per minute, or almost 300,000,000 daily throughout the dry season.

Experience over a considerable period of operation has demonstrated the advantage of overhead irrigation for bananas. One outstanding feature is the importance of being able to deliver water when needed and where needed at costs within practical limits. Improvement in production, with respect to both weight and quality, also appears to be directly traceable to the installation of overhead irrigation systems.



*Sprinkler head on riser in operation*

*An Alco Diesel pumping unit which is typical of many power installations for banana irrigation.*


# TWO DIESEL TUGS FOR PANAMA CANAL

*By* WILL H. FULLERTON

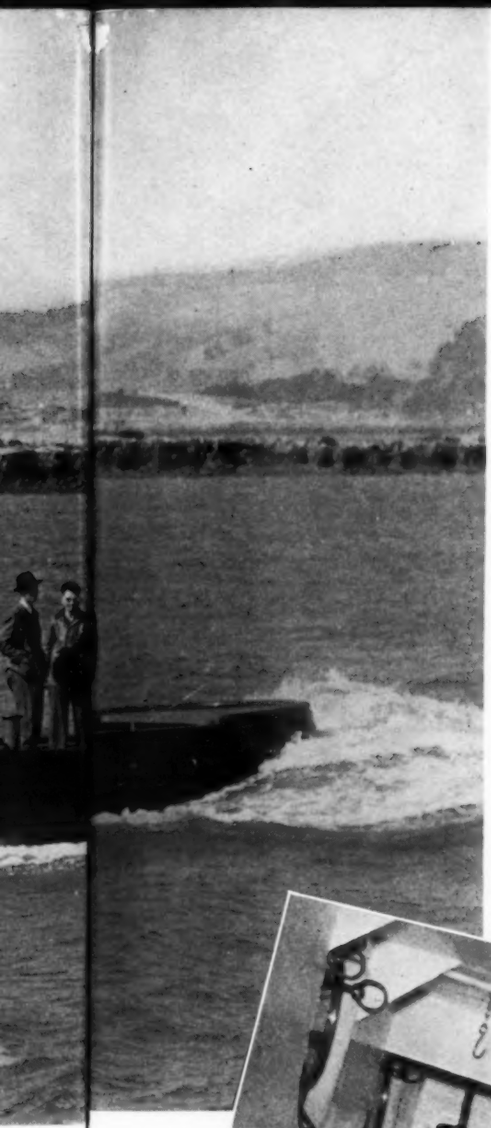
IT is generally conceded that the Panama Canal is one of our most vital life-lines in peace time or come war. Also, that in the event of war the Canal must be ready for the speedy and certain dispatch of warships from coast to coast. To this end, every effort is now being directed in line with our great preparedness program.

It was inevitable from the start that Diesel engines would play a vital role in this program and here in these two new Panama Canal tugs we again find recognition of Diesel availability and dependability.

Assigned to the Panama Canal for operation under the supervision of the U. S. Army Engineers the two sturdy sister tugs "Diablo" and "Chame", pronounced Cha-may, were built by the Berkeley Steel Construction Company, Inc., Berkeley, Calif., to lines furnished by the government and design developed by the builders.

These craft are 53′ long, 14′ wide and have a 6′ draft loaded. The hulls are of all welded steel construction, the first of this type to be built in San Francisco Bay. Mr. N. Couzins, engineer for the builder, estimates that welding in this class of vessel saves about 15% in weight.

Considering the crucial test to which these tugs are potentially subject, although their present job will be to handle barges on construction of a new set of canal locks, it is significant that Diesels were selected for their propulsion. The main engine for each vessel is an Enterprise, 6 cylinder, 9½″ bore, 11½″ stroke, direct reversible, marine Diesel rated 200 hp. at 450 rpm. driving through a Kingsbury air-cooled thrust bearing and 6″ Tobin bronze tail shaft on which is mounted a 48″ x 26″ Federal Mogul bronze propeller. Two bunkers provide capacity for 700 gal. of fuel oil and extra tanks are provided for 100 gal. of fresh water and

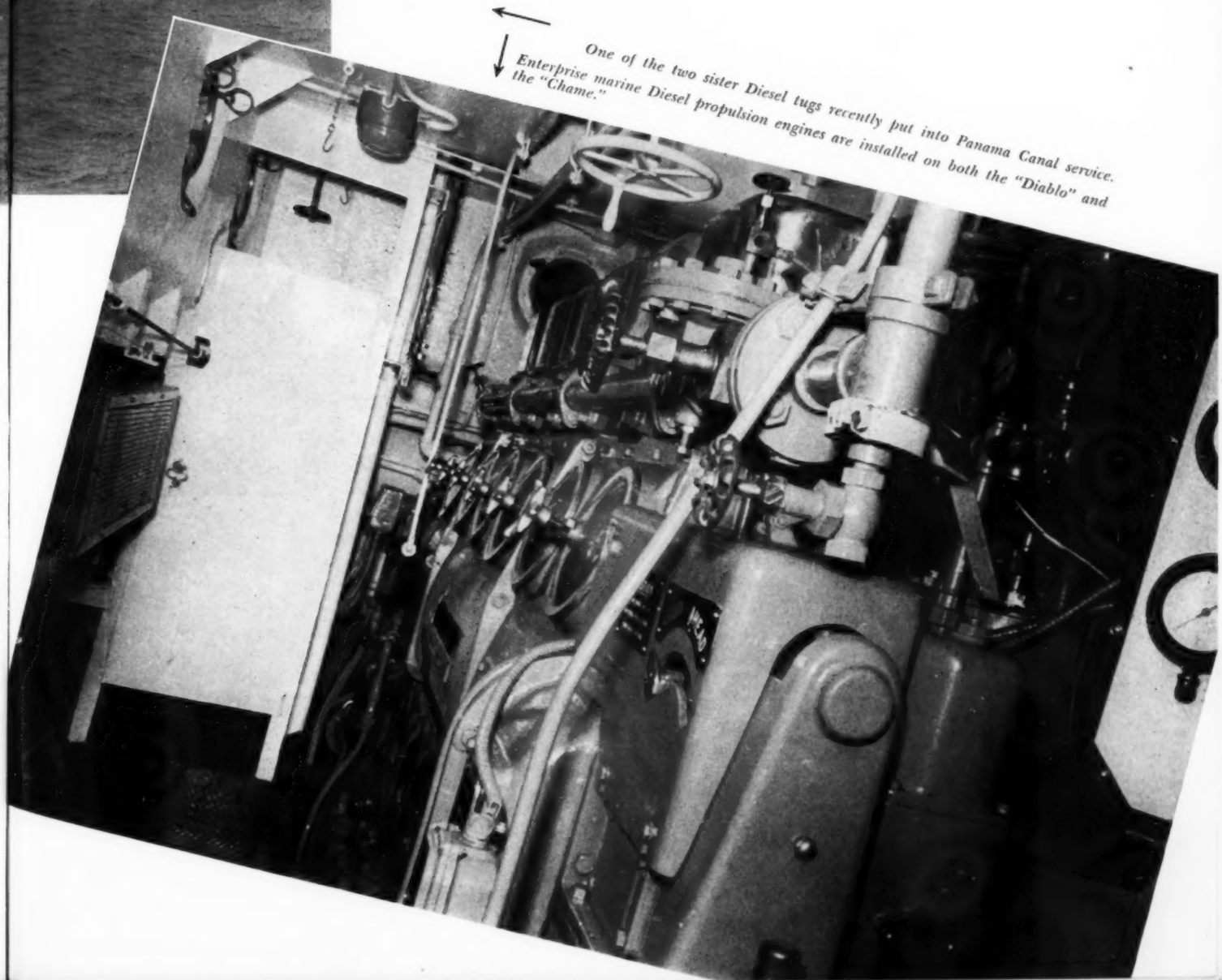


25 gal. of lube oil. Lube oil is reclaimed continuously by a Briggs Clarifier. A Viking Safety control is fitted to the main engine. Copper piping is used for air, oil, and water lines.

The shaft generator is a 2 kw. Westinghouse machine which handles the bilge pump motor and battery charger. A 16 cell Exide Ironclad battery acts as a current reservoir. Starting air is supplied by a gas engine driven Rix compressor. The main engine is fitted with a Vortex spark arresting muffler. A Ross heat exchanger is fitted to the closed engine jacket water cooling system and lube oil is cooled by a unit of the same make.

The oak trimmed pilot house is equipped with a Richie compass, Seth Thomas clock, engine room signals, tell-tale panel for running lights, speaking tubes and a mechanical helm indicator, the latter being manufactured by the boat builders. Quarters for a crew of four are provided, and one more may be quartered in the pilot house if necessary. Fire protection is afforded by both fire hose and a built-in $CO_2$ fire extinguisher system for the engine room.

These sturdy craft are excellently fitted for the job expected of them. The instant availability of their Diesel propulsion engines, is a factor of utmost importance, which it is hoped may never be put to the ultimate test, but which it is good to know has been provided. Much credit for the design and construction of these vessels goes to T. S. and D. S. Neilson, President and Vice President respectively of the Berkeley Steel and Construction Company, Inc. In fact, these gentlemen are the company and they have spent most of their lives in the boat building business, having established a record in boat construction during the World War. The consulting naval architect on the tugs "Diablo" and "Chame" was George Wayland of San Francisco.



*One of the two sister Diesel tugs recently put into Panama Canal service. Enterprise marine Diesel propulsion engines are installed on both the "Diablo" and the "Chame."*

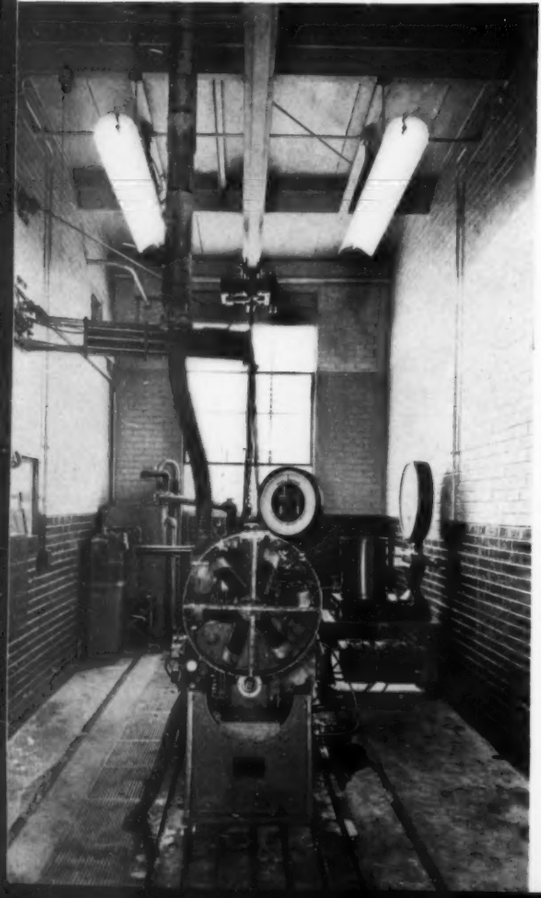
*Cummins' new Austin-built research building at Columbus, Indiana.*

tographs courtesy the Austin Company, Engineers and Builders.

*The experimental machine shop. The offset, left rear, is a cold room where engine starting tests are made at temperatures down to 30° below zero.*

*One corner of the chemical laboratory.*
*One of the Diesel engine test rooms.*

# NEW CUMMINS BUILDING FOR DIESEL RESEARCH



THE general increase in demand for Diesel engines, resulting from industrial expansion and the national defense program, finds the Cummins Engine Company occupying its new research and development building at Columbus, Indiana. This most recent addition to the Cummins' facilities provides many unique testing and experimental features. Included in this compact research building is a spacious and fully equipped experimental machine shop.

Six test rooms, each 10 ft. x 21 ft., are ranged along one side of the building. Each room is provided with chain hoist, ventilating fans, engine exhaust vents, and fluorescent lighting for accurate testing and observation. Corridors between each pair of test rooms are equipped with all the required meters and controls for test operation. They are so arranged that tests may be conducted and observed in opposite rooms simultaneously from a single position. The actual test devices include tachometers, thermometers, air, water, and oil pressure gauges, vacuum gauges, and fuel meters. A Leeds & Northrup potentiometer with multi-switch is used to accurately check temperatures at various points on the engine. A "strobotack" is used to study spring action, valve seating, and rocker arm action.

A cold room in which arctic conditions are simulated is used for cold starting tests. In addition to an observation window, a telephone is installed in the cold room for the use of the test engineers in reporting their findings. Completely equipped chemical and metallurgical laboratories have been provided. Other equipment includes a Baldwin-Southwark tension-compression testing machine of 200,000 pounds capacity and a 100 inch-pound Tinius Olsen impact testing machine. The building includes engineering and control offices. The two Cumminses and A. F. Loertz, plant engineer, who collaborated in designing the plant, are to be congratulated on this fine contribution to the Diesel Industry.

## A. D. MacLEAN ELECTED VICE PRESIDENT OF PITTSBURGH EQUITABLE METER

COLONEL W. F. Rockwell, President of the Pittsburgh Equitable Meter Company, has announced the election of Mr. A. D. MacLean to the Vice Presidency of the Company.

Mr. MacLean is a graduate of the School of Engineering, Harvard University. Immediately upon receiving his degree, he enlisted in the Army Air Service Corps, serving therein until the Armistice in the World War. His first connection in industry was with the Ashton Valve Company of Cambridge, Mass., as Chief Draftsman. He later accepted a position with the Engineering Department of the New Departure Division of General Motors Corporation and was subsequently promoted to become Assistant Chief Engineer.

In 1926 Mr. MacLean joined the EMCO organization as Chief Engineer, which position he has filled until the present date.

Mr. MacLean is well known in industry as an author and lecturer on technical subjects.

**So far 414 owners of Industrial Power Plants, not NOW owning Diesel Engines, have ordered a copy of the Fifth Edition, DIESEL ENGINE CATALOG. See page 64, and use the coupon.**

## "SIMPAC" POWER UNIT SUBJECT OF NEW LEAFLET

A NEW illustrated leaflet describing the recently announced "Simpac" power units has just been announced by the Westinghouse Electric & Manufacturing Company. These units are self-contained AC generators, with integral exciters, instruments, voltage regulators and control. They are especially useful in out-of-the-way localities, or for specialized industrial applications where AC power is not readily available.

The leaflet contains a general description of the unit, giving its construction features and details. Each integral part of the device, such as the AC generator, the exciter, instruments, voltage regulator, and the control are fully covered.

Copies of descriptive data 3808 may be obtained upon request from department 7-N-20, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. For price information, write for price list 3808.

# Latest Diesel Patents

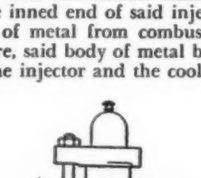
*A description of the outstanding patented inventions on Diesel and Diesel accessories as they are granted by the United States Patent Office. This information will be found a handy reference for inventors, engineers, designers and production men in establishing the dates of record, as well as describing the important Diesel inventions.*

*Conducted by* C. CALVERT HINES*

* Patent Attorney, 811 E. Street, N.W., Washington, D. C.

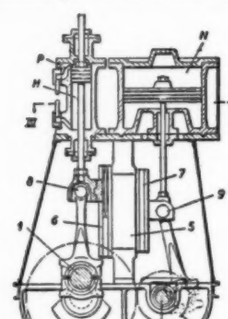
2,175,450
INTERNAL COMBUSTION ENGINE
Edvin Ossian Parcival Thege, Stockholm, Sweden, assignor to Aktiebolaget Atlas Diesel, Sickla, Stockholm, Sweden, a corporation of Sweden
Application August 13, 1936, Serial No. 95,768
In Sweden August 28, 1935
6 Claims. (Cl. 123—32)

6. In an internal combustion engine having a combustion chamber, a fuel injector, cooled wall structure around said injector and a body of readily distortable metal having relatively high heat conductivity extending entirely around the injector, a portion of said wall structure being disposed between said body of metal and said combustion chamber and contacting the inned end of said injector to shield said body of metal from combustion chamber temperature, said body of metal being confined between the injector and the cooled wall structure and in contact with both to provide a heat transmitting medium for rapidly conducting heat from the injector to the cooled wall structure.

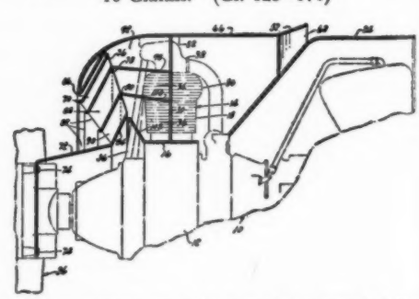


2,173,541
COMPOUND ENGINE
Willy Rieger and Otto H. Hartmann, Kassel-Wilhelmshohe, Germany
Application May 13, 1937, Serial No. 142,502
In Germany May 29, 1936
8 Claims. (Cl. 121—102)

1. A cross-compound engine comprising a high pressure stage, a low pressure stage, and power transmission means connecting said stages, the stroke volumes per unit of time of said stages being in a ratio of at least 1:30 and said power transmission means having a ratio ranging substantially from 1:4 to 1:2 to maintain a proportional differential in speed between said stages.



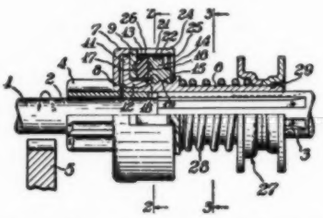
2,174,418
ENGINE COOLING MEANS
Donald S. Hersey, West Hartford, Conn., assignor to United Aircraft Corporation, East Hartford, Conn., a corporation of Delaware
Application March 26, 1937, Serial No. 133,167
10 Claims. (Cl. 123—171)



1. In combination with a radial air-cooled internal combustion engine having a plurality of

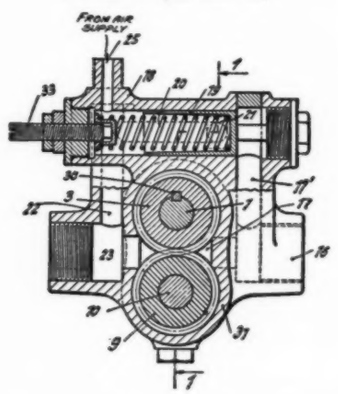
radially disposed cylinders each comprising a barrel portion and a head portion provided with cooling surfaces, and means providing a flow of cooling air past said cylinders, means comprising a plurality of concentric annular guide members providing separate air passages to the head portions and barrel portions of all of said cylinders, like portions of said cylinders being included in a single passage, said guide members being arranged to provide, for said passages, air outlet openings of different degrees of restriction to impose on the air flowing through said passages, differential pressure heads proportional to the cooling requirements of the head portions and the barrel portions of said cylinders.

2,173,983
ENGINE STARTER GEARING
Youston Sekella, Elmira, N. Y., assignor, by mesne assignments, to Bendix Aviation Corporation, South Bend, Ind., a corporation of Delaware
Application January 5, 1938, Serial No. 183,500
3 Claims. (Cl. 74—7)



1. In an engine starter, a shaft, a sleeve splined thereon, a pinion freely journalled on the shaft for longitudinal movement into and out of engagement with a member of an engine to be started, a barrel member fixed at one end to the pinion and surrounding one end of the sleeve, a stop nut rigidly anchored on the sleeve, a clutch member threaded on the sleeve, a clutch disc loosely mounted on the sleeve between the stop nut and clutch member and rigidly anchored in the barrel, a ring of elastic material having a high coefficient of friction loosely mounted on the sleeve adjacent said clutch disc, and a detent mounted on the clutch member and splined in the barrel causing rotation of the sleeve to actuate the clutch member to clamp the ring and clutch disc against the stop nut.

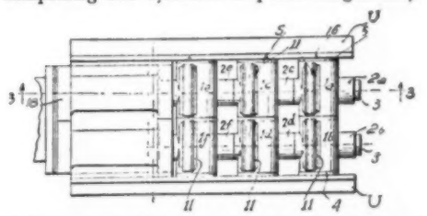
2,173,578
APPARATUS FOR FEEDING FUEL TO INTERNAL COMBUSTION ENGINES
Fritz Egersdorfer and Franz Wucherer, Berlin, Germany
Application August 31, 1937, Serial No. 161,824
In Germany August 5, 1935
4 Claims. (Cl. 103—42)




1. An apparatus for feeding fuel to internal combustion engines, comprising two pumps having their suction passages adapted to be connected to the supply of fuel and having a common pressure conduit for the supply of fuel to the internal combustion engine, and a regulating device connected with said pressure conduit and with both suction passages and constructed for returning excess of fuel to both suction passages.

2,173,549
SILENCER FOR ENGINES
Henri Coanda, Clichy, France
Application May 1, 1937, Serial No. 140-116
In France June 12, 1936
10 Claims. (Cl. 181—60)

3. In a silencer for the exhaust from a motor, a series of identically shaped adjacent interconnected elements each element forming a whole comprising two cylinders disposed tangentially



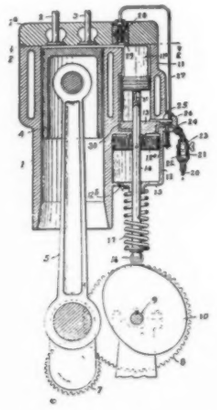
and perpendicularly to each other, the diameter of one of said cylinders being substantially greater than of the other cylinder, a socket connecting the assembled unit of said elements to

the exhaust port of the engine, an embossment provided upon the inner wall of the larger cylinder, a narrow slot in the wall of the larger cylinder adjoining said embossment, and a flap protruding outside the cylinder wall and extending rearwardly in regard of the direction of flow, in the smaller cylinder.

**Ship Owners and Operators find the DIESEL ENGINE CATALOG, Volume Five, intensely interesting and valuable. 98 such orders have been received so far, and the book only came out August 15.**

2,170,818
INTERNAL COMBUSTION ENGINE
Edward Hanson, Cleveland, Ohio
Application November 16, 1937, Serial No. 174,784
13 Claims. (Cl. 123—33)

1. An internal combustion engine comprising a main cylinder having air inlet and exhaust valves, a piston therein, a separate cylinder arranged to form at one end a combustion chamber in communication with one end of said main cylinder, the opposite end of said separate cylinder being arranged to form a fuel compression chamber, a conduit leading from said fuel compression chamber to said combustion chamber, means for supplying fuel into said compression chamber, a piston in said separate cylinder arranged to be operated by the air compressed by the piston in said main cylinder in the compression stroke thereof to compress the fuel in said fuel compression chamber, and mechanism for controlling the movement of said last mentioned piston in relation to the movement of said first mentioned piston, said mechanism including means for increasing the speed of said last mentioned piston at a predetermined position thereof in its compression stroke, whereby the compressed fuel is injected into said combustion chamber.



**Various Government Departments and Officials, to the tune of 211 to date, have purchased copies of the Fifth Edition, DIESEL ENGINE CATALOG. See page 64, and use the coupon.**

2,172,383
FUEL INJECTION DEVICE
Harlan Verne Honn, San Francisco, Calif.
Application March 23, 1936, Serial No. 70,263
9 Claims. (Cl. 299—107.1)

8. In a fuel injection nozzle of the character described, a disk having an axial orifice therethrough and a volute channel in its inner face, a block member bearing against the inner face of said disk to cover said channel and thereby define a fuel duct, a fuel inlet passageway in said block in communication with the outer end of the duct in the disk, an axial valve bore in said block in alignment with the orifice in said disk, passageways in said block estab-

lishing communication between the inner end of the duct and the orifice in the disk through said valve bore, and retainer means to keep said block and said disk in juxtaposition.

2,173,811

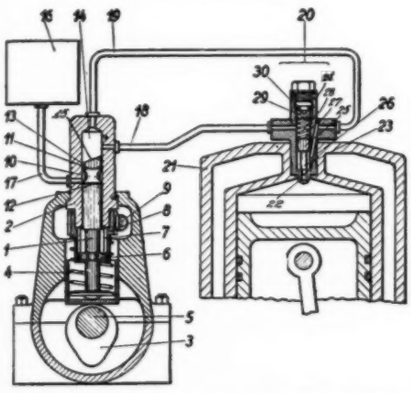
## METHOD AND APPARATUS FOR OPERATING FUEL INJECTION DEVICES IN INTERNAL COMBUSTION ENGINES

Bernhard Bischof, Winterthur, Switzerland

Application January 7, 1937, Serial No. 119,516

In Switzerland January 16, 1936

11 Claims. (Cl. 123—139)

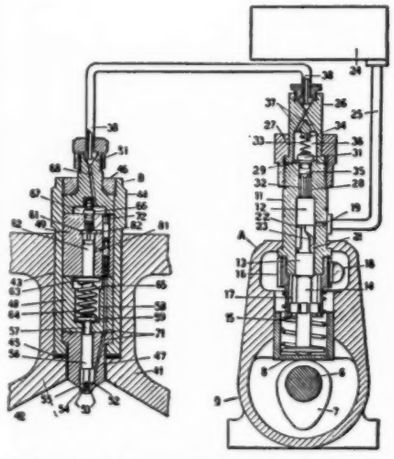


1. The method of operating the fuel injection valve of an internal combustion engine in which the injection valve is operated by a double acting expansible chamber motor having a valve-loading working space, a valve-opening working space, and an injection passage communicating with the latter and controlled by the valve, the valve being biased to close when pressures in said working spaces approach equalization, which method comprises compressing fuel oil into both working spaces until a substantial pressure is developed in both, then isolating the valve-loading space, and continuing compression into the valve-opening space, and finally lowering the pressure in said valve opening space; and repeating the above valve operating sequence in time with the cycle of the engine.

2,173,814

## FUEL INJECTION APPARATUS FOR INTERNAL COMBUSTION ENGINES

Bernhard Bischof, Winterthur, Switzerland



Application May 10, 1939, Serial No. 272,916

In Switzerland March 15, 1938

12 Claims. (Cl. 123—139)

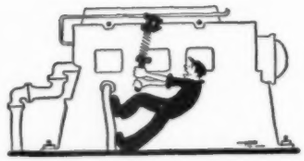
1. In a fuel injection device, the combination of a fuel injection valve; yielding means biasing said valve in a closing direction; a movable abutment subject to the pressure of fuel delivered to the fuel injection valve and connected with the valve to open the same in response to rising fuel pressure; a fuel pump having a discharge connection, the pump being adapted to force fuel under pressure periodically through said connection and at the termination of each periodic discharge to cause a limited reflux; a preliminary injection piston interposed in a connection between said pump discharge and said injection valve; means limiting the range of reciprocation of said piston; a movable loading abutment for increasing the loading effect of said yielding means; valve means having an opening characteristic upon motion of said preliminary injection piston toward said injection valve and serving to control admission of fuel from said discharge connection to act on the loading abutment; valve means opened by the loading movement of the loading abutment to open a normally closed path from said discharge connection to said injection valve; and flow restricting means effective upon the occurrence of reflux to permit delay dissipation of pressure acting on said loading abutment.

## CHICAGO PNEUMATIC APPOINTS

CHICAGO PNEUMATIC TOOL COMPANY announces the appointment of Mr. P. J. Christy as Manager of their Philadelphia, Pa., office, effective August 1, 1940. He succeeds Mr. A. M. Brown who has been transferred to Washington, D. C. as Manager of the new branch recently opened there.

The Company also announces the appointment of Mr. C. A. Diehl as Manager of the Houston, Texas office.

**Up to September 15, Superintendents of Municipal Power Plants, to the number of 318, had ordered copies of the DIESEL ENGINE CATALOG, Volume Five. Have you ordered your copy? See page 64.**





## PITTSBURGH EQUITABLE MERCO–NORDSTROM INSTALL FIELD SERVICE TRUCK IN MIDWEST

AS a service and convenience to their many customers in the Midwest, the Pittsburgh Equitable Meter Co. and subsidiary, the Merco-Nordstrom Valve Co., now have in operation from their Chicago office a completely equipped field service truck.

This truck is fitted with the necessary tools, lubricants and test apparatus to handle properly the field maintenance of EMCO and Nordstrom products. It is in charge of Mr. Paul Payton, service engineer, who is thoroughly trained in factory methods and maintenance procedure on all the company's products.

Captain A. E. Higgins, Sales Manager, also announced that a similar unit has been ordered for use in the Mid-Continent area, to operate out of the Tulsa office and that additional service trucks would be placed in service in the near future in other sections of the country.

## STRYKER APPOINTED

CLINTON E. STRYKER has been appointed Vice President and Assistant to the President of the Nordberg Manufacturing Company of Milwaukee, Wisconsin, manufacturers of Diesel Engines, Uniflow Engines, Compressors, Symons Cone Crushers and Screens, Mine Hoists and other heavy machinery, as well as Railway Track Machines.

Mr. Stryker was a partner in McKinsey, Kearney & Company, Management Engineers, of Chicago, having been with that firm for five years. Prior to that he was with Fansteel Metallurgical Corporation for a number of years in various administrative capacities. He graduated from the Armour Institute of Technology in 1917 and is a Fellow of the American Institute of Electrical Engineers and a member of the Society of Automotive Engineers.

**72 Naval Architects now have copies of the DIESEL ENGINE CATALOG, Volume Five, in their files. It's an invaluable reference book on Diesel Engines. See page 64, and use the coupon.**

## FAIRBANKS, MORSE & CO. WILL CONSTRUCT NEW BRASS FOUNDRY

PLANS for a new non-ferrous metals foundry, at Fairbanks, Morse & Co., Beloit, Wisconsin, have been made known by A. C. Howard, general manager. The plans, drawn by O. D. Conover, Cleveland, architect and industrial engineer, call for a building 80 feet by 220 feet with architectural lines closely resembling those of the pattern shop.

Bids will be received by Fairbanks, Morse & Co. as soon as plans are completed, Mr. Howard said, and construction probably will take six to eight months.

The new foundry, which will be located on the west side of the company property filling the space between the pattern shop and north foundry, will be large enough to handle all of the non-ferrous metals production required in Fairbanks-Morse equipment. The capacity of the new foundry will be from two and a half to three times greater than the present non-ferrous foundry. Fairbanks, Morse & Co. turns out approximately twenty-two different standard alloys including brass, bronze, high brass, zinc and tin alloys.

In addition to having a larger melting capacity, the new foundry will contain the latest type of cleaning and sand-handling equipment which will make it possible to produce the finest type of castings, both in appearance and quality. Recent design core ovens will be used.

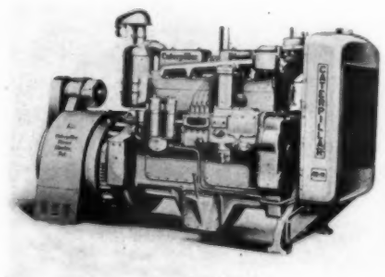
## A BOOK ON PISTON RINGS

THE Piston Ring Handbook for Engineers has been issued by the Double Seal Ring Co., Fort Worth, Texas. Seventy-two pages, size 5½" x 7¾", handsomely printed in two colors, this useful little book contains a wealth of engineering data on the various types of piston rings manufactured by the Double Seal Ring Company. A copy will gladly be sent to you if you write your request on your letterhead or the letterhead of your company and mail it to their headquarters at Fort Worth, Texas.

## TWO NEW CATERPILLAR DIESEL ELECTRIC SETS

TO ROUND out its popular line of Diesel Electric Sets, Caterpillar Tractor Co. has announced two new models, the 88-41 and the 77-34.

Both units are powered by four-cylinder Diesel engines. The 88-41, with a bore of 5¾" and an 8" stroke, develops 41 kw. at 900 rpm., when equipped with radiator fan. Without fan, kilowatt rating is 44.



*The Model 88-41*

The 77-34 has a bore and stroke of 5¼" x 8", and develops 34 kw. at the same rpm. when equipped with fan. It is rated at 36 kw. without fan. Both ratings are for the polyphase, 60-cycle set. Single phase ratings are slightly lower.

The sets are completely self-controlled, requiring no gadgets other than a circuit breaker. They are easy to install, and can be set up and running in less than an hour after delivery. Inbuilt regulation enables the sets to pick up relatively large motor loads with a minimum of light flicker and voltage drop. Because of the wide application of these sets, maintenance problems have been simplified by having the entire unit serviced by Caterpillar distributors. They are designed to be operated by personnel without special training.

There are only three operating adjustments on the engines, and none of these involves the fuel system. The generators are direct-connected, rotating field type, available as 3-phase or single phase, 60-cycle or 50-cycle, and with a wide variety of voltages.

## NEW ALUMINUM BOOKLET

PREPARED by the Dynamic Laboratory of the Aluminum Company of America, this new booklet, which describes the types of Aluminum pistons, materials, and finishes, together with information on the Aluminum cylinder heads, will prove of interest to both the engineer and the layman.

Numerous drawings and photographs illustrate the various points wished emphasized, thereby giving more clarity to the subject.

Copies of this interesting pamphlet may be had for readers of DIESEL PROGRESS by writing to the above company at its office in Pittsburgh, Pennsylvania.

**648 Diesel Salesmen have bought copies of the Fifth Edition of the DIESEL ENGINE CATALOG to date. See page 64 for a convenient coupon for YOUR use.**

NOTICES have recently been sent to the trade announcing that the name of Jadson Motor Products Company has been changed to Thompson Products, Inc. According to P. D. Hileman, general manager of the West Coast Plant, this change is merely a legal procedure in no way affecting the personnel, policies, or products of the company.

The plant of Thompson Products, Inc., at 8354 Wilcox Ave., Bell, California, occupies a three acre tract where three shifts daily are constantly employed in most of the departments. The company manufactures a complete line of poppet valves designed for all sizes of internal combustion engines from small midget racing cars to the largest motorships. Also being developed is a new line of fuel and booster pumps which have been approved by the U. S. Government and adopted by both the army and navy air corps.

The recent addition of $150,000 worth of new machinery, thread grinders and electric gathering machines, equips this manufacturer to meet the valve requirements of virtually every make and type of Diesel engine.

## FRESH WATER JACKET COOLING

THE importance of providing safeguards to marine Diesel engines is so generally acknowledged that the subject is no longer one of debate. Prior to the adoption of fresh water for cooling the cylinder jackets, much trouble developed. The sea water precipitated solids that, adhering to the jacket walls, insulated them with the result that the heat generated in the cylinder could not be properly dissipated. Cracked liners developed. Aside from the replacement cost the outage time was expensive. To provide insurance against such accidents, fresh water jacket cooling was adopted as standard practice.

The coolers or heat exchangers are built to the requirements of the A.B.S. and other governmental agencies, and should embrace design features as, viz., the inside of the tubes, through which the cooling sea water passes, should be capable of being cleaned without breaking pipe joints. Ample reserve capacity in the matter of tube cooling surface is essential. The design should also permit the withdrawal of the complete tube bundle. Contraction and expansion of tubes is taken care of by this latter design feature as fixed and floating tube sheets are provided, the former packed against leakage. For each of the two C-1 class ships, building at the Pennsylvania Shipyards, the heat exchanger equipment includes three lubricating oil coolers for the main propelling engines, three jacket water coolers and two fuel oil heaters, a fuel oil heater for the purifier, two lubricating oil heaters and one 30-ton per day oil and water separator. All of this equipment is from the designs and is being manufactured by the Condenser Service & Eng. Company, Hoboken, N. J.

The lube oil coolers and the jacket water coolers have their sea water circuits in series. Each lube oil cooler handles 300 gpm. of oil. Viscosity 500 S.S.U. at 100° cooling it from 140° to 115° when using 500 gpm. of sea water entering at 81° and discharging into the jacket water coolers at 91.5°. Each jacket water heat exchanger cools 430 gpm. fresh water from 140° to 120° when circulating 500 gpm. of sea water. The overload temperature being 108.6°. Effective surface is 560 square feet each.